# Nature Magazine

APRIL
1958

VOLUME 51
NUMBER 4

50 Cents

## Roger Tory Peterson's

# FIELD GUIDE SERIES

Roger Tory Peterson, originator and editor of the famous Field Guides, has probably taught more people about birds than any other man now living. His classic *A Field Guide to the Birds* has become indispensable to both beginners and experts and is used in every university that teaches ornithology. Other guides under his editorship follow the same system.

The Peterson Field Guide Series has revolutionized identification in the field. These are the basic books for every nature student whatever his specialty. This series has the unqualified endorsement of the American Nature Association.

**1 A Field Guide to the BIRDS**

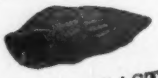
**By Roger Tory Peterson**

Universally known as the "Bible of the Ornithologists." Field marks of all birds — songbirds and waterfowl — of the eastern and central states. Called by *Life* "the best of modern bird guides." 1000 illustrations, 500 in full color. **$3.95**

**2 A Field Guide to WESTERN BIRDS**

**By Roger Tory Peterson**

The standard western guide using Peterson's unique Field Guide System. 740 illustrations, many in color. **$3.95**



**3 A Field Guide to the SHELLS**

**OF OUR ATLANTIC AND GULF COASTS**

**By Percy A. Morris**

The beachcomber's companion. If casting for channel bass in the surf, bird watching along the shore, swimming, or merely lolling on the beach you will want this one. Over 400 illustrations, 102 in full color. **$3.95**

**4 A Field Guide to the BUTTERFLIES**

**By Alexander B. Klots**

"Unquestionably this is the finest book on American butterflies to be published since 1889." *Vladimir Nabokov, N. Y. Times.* 417 species illustrated, 247 in full color. **$3.95**

**5 A Field Guide to the MAMMALS**

**By William Burt and Richard Grossenheider**

Field marks of all species found north of the Mexican boundary. The most extensive collection of color illustrations of American mammals ever published. 187 species illustrated in full color, also drawings and range maps. **$3.95**

***Also by Roger Tory Peterson***

**Wildlife in Color**

A picture book for everyone who loves the outdoors. 450 full color illustrations by eighteen of America's leading wildlife artists, text by Roger Tory Peterson. **$3.75**

***Do you have all these titles on your nature bookshelf? Each shelf-back bears a number identifying it as a Peterson Field Guide. Fill out this coupon and mail today.***

**AMERICAN NATURE ASSOCIATION**
**1214 16th St. N.W., Washington 6, D. C.**

Please send me:

1 A Field Guide to the Birds .....copies at $3.95 each
2 A Field Guide to Western Birds ....copies at $3.95 each
3 A Field Guide to the Shells .....copies at $3.95 each
4 A Field Guide to the Butterflies ....copies at $3.95 each
5 A Field Guide to the Mammals .....copies at $3.95 each
Wildlife in Color .....copies at $3.75 each

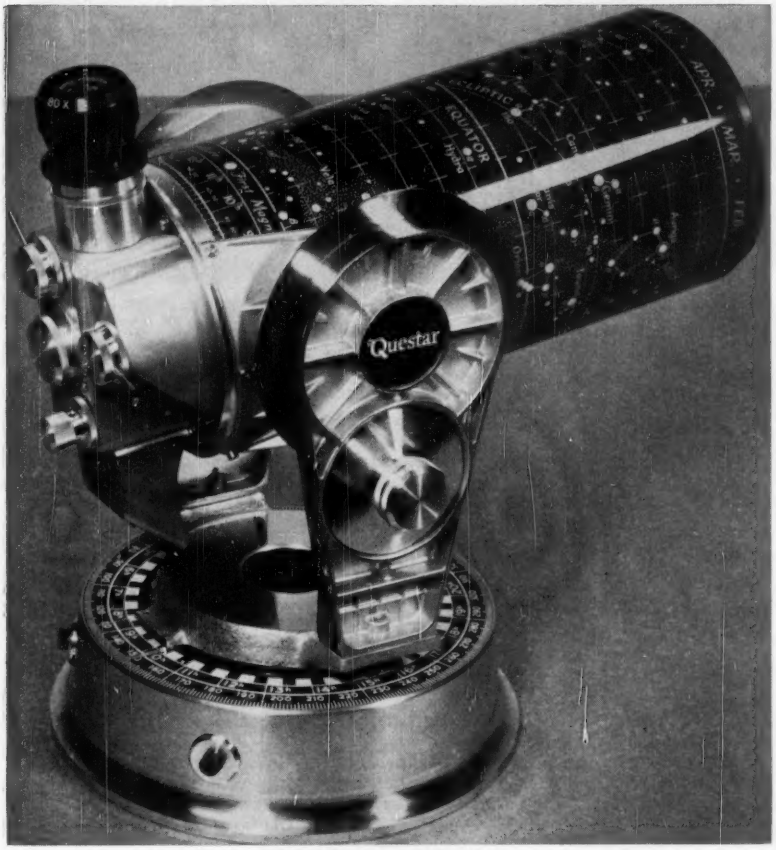
☐ Enclosed is ..... ☐ Send C.O.D.

Name .....

Address .....

City ..... Zone..... State.....

# *Introducing* THE INCOMPARABLE QUESTAR *to the naturalist*




This beautiful instrument was made for you and your family to enjoy for a lifetime. It is the De Luxe Model Questar, the world's only multi-purpose telescope, and is here shown as you might use it for observing nature from your porch or garden table.

Questar will reach out and bring the world to you with simple ease and convenience. It will resolve detail of feathers at several hundred feet, read a watch at a quarter mile, resolve the stem of each tree leaf against the sky a mile away. With Questar you sit in the center of a circle 2 miles in diameter and nothing on its periphery appears to be more than 33 feet away.

With the amazing sharpness of Questar's optics you now have the power and clarity to reach out and grasp for your delighted eyes a host of things you never realized were there. Thus in the most unlikely landscapes you are apt to discover unsuspected wildlife not seen with the unaided eye, serenely unaware of you as you observe at 40, 80 or 160 diameters magnification.

Until now, the only optical systems that could produce good images at such high powers were those of full-size astronomical telescopes. Those who wanted high powers just had to cope with the awkward bulk and heavy weight of long-tubed conventional telescopes built for celestial use. Their upside-down images can be erected, but nothing can make them focus on even moderately near things.

*Every Questar now has aspheric catadioptric optics and each is guaranteed to resolve 0.9 second on a National Bureau of Standards test chart furnished with each instrument. This test is equivalent to reading this page at about 300 feet.*

The major miracle of the portable Questar is that a telescope of 7 feet effective focal length has actually been compressed by optical folding into Questar's 8-inch barrel. This is made possible with Questar's new kind of optics, the catadioptric, or mixed lens and mirror system. Its images are right side up and its tremendous power can be used as close as 8 feet.

The minor miracle is that such magnificent definition can originate in an instrument so small and compact, for the 7-pound Questar, weighing 11 pounds when carried in its handmade English leather case, is a complete portable observatory. It is electrically driven to follow the stars and has every refinement of great observatory instruments. Indeed, if you have thought to observe the heavens, no instrument so frees you from the problems of storage, moving and setting up, which burden owners of conventional telescopes. And you can take it with you everywhere, even attach it to your car when you travel for exciting views of the countryside. For no greater mistake could be made than to conclude that Questar is primarily for celestial work—astronomy is but one of its uses, and it would be odd not to make the most of it.

In our 8 years of research and development, we were endeavoring to create a telescope tailored to fit the user. This was a most novel concept and to our delight we found that when we had an instrument that fit the observer, was easy to use and always ready to use, we ourselves were using it constantly! And then we discovered what so few before us had ever had a chance to find out—the pleasures of nature study at great distances. We simply had no idea that so much beauty and so much wildlife activity awaited those equipped to look with very high power into what just seemed an ordinary landscape view. To our amazement, too, we realized that we had the world's first long-distance microscope, which opened the portals of a veritable fairyland of tiny flowers and insects to our startled eyes.

*A De Luxe Questar was chosen as a gift of the President of the United States to His Majesty King Mohammed V of Morocco on the occasion of his recent visit to this country.*

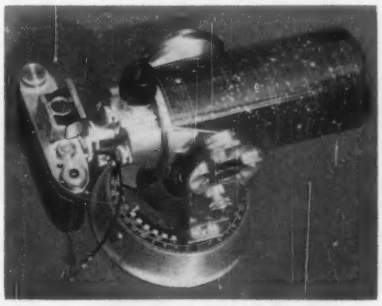
We think many of you would get the same keen pleasure from these things all year round. If you take pictures, Questar is a Big Bertha of telephoto lenses for 35 mm. work, with its prime focal length of 1077 mm.

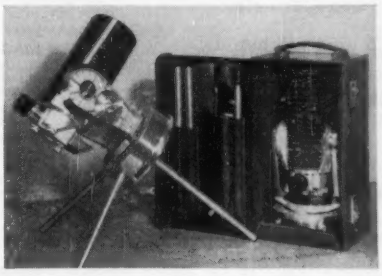
This is indeed great power, and to control this power, this ability to resolve detail, Questar's mounting is designed with your comfort and ease of operation always in mind. Built-in accessories are engaged by finger-flick levers; and sweet-feeling, slow-motion drives provide rock-steady images.

The De Luxe Questar is priced at $995. Literature and our time payment form available on request.

**QUESTAR CORPORATION**

Box 20 • New Hope, Pa.





# Nature *Magazine*

APRIL, 1958 VOL. 51 NO. 4

**Published by the AMERICAN NATURE ASSOCIATION to stimulate public interest in every phase of nature and the out-of-doors, and devoted to the practical conservation of the great natural resources of America.**

IN THIS ISSUE

Baltimore Oriole.....*Cover Hexom*
Nature in Print.....*Howard Zahniser* 172
Contents Noted.....*R.W.W.* 175
Luminous Life.....*Wilfred T. Neill* 176
The Sentries.....*Betty John* 180
Call of the Whippoorwill.....*August Derleth* 181
Fairy Princess of Springtime..*Ruth H. Dudley* 183
Nosey Pisote.....*Elizabeth Ingles* 184
Traffic (Poem).....*John Gallinari Whidding* 187
Boarding House for Butterflies....*Philip Brady* 188
Puzzle of the Yellow Dye Tree *Helen M. Kovar* 191
Jack and His Brother.....*W. Bryant Tyrrell* 192
The Japanese Honeysuckle.*Franklin C. Daiber* 193
These Are Your Highways..... 195
Cactuses of Strawberry Canyon. *Norman Pietan* 198
A Poisonous Subject (Editorial)..... 201
Thomas Jefferson, Statesman and Scientist.....*Eva Beard* 202
The Omnivorous Codfish..*Bernard L. Gordon* 205
Red-Winged Balladiers (Poem) *Emeline Ennis Kotula* 207
Insects Can Be Fun.....*Alvah Peterson* 208
Lavender For Spring (Poem)...*Jane Morrison* 211
Great Star Catalog Case.*Simone Daro Gossner* 212
Nature in the School.....*E. Laurence Palmer* 214
The Nature Camera.....*Edna Hoffman Evans* 216
Nature and the Microscope *Julian D. Corrington* 222

THE ASSOCIATION

*President*
RICHARD W. WESTWOOD.....*Washington, D. C.*
*Vice-President*
HARRY E. RADCLIFFE.....*Washington, D. C.*
*Secretary-Treasurer*
JAMES A. O'HEARN.....*Sea Girt, N. J.*
*Director, Nature Education*
DR. E. LAURENCE PALMER...*Cornell University, N. Y.*
*Director, Public Motivation Study*
DR. THOMAS F. JORDAN.....*Tucson, Arizona*
*President Emeritus*
ARTHUR NEWTON PACK.....*Tucson, Arizona*

SCIENTIFIC CONSULTING BOARD

DR. WALDO L. SCHMITT
*Retired Head Curator, Zoology, U. S. National Museum*
DR. HARRY C. OBERHOLSER
*Retired Ornithologist, U. S. Fish and Wildlife Service*
W. L. McATEE
*Retired Biologist, U. S. Fish and Wildlife Service*
DR. PAUL BARTSCH
*Retired Curator of Mollusks, U. S. National Museum*
DR. EDGAR T. WHERRY
*Wild Flower Preservation Society*
DR. WILLIAM M. MANN
*Retired Director, National Zoological Park*
DR. W. H. ANDERSON
*Entomologist, U. S. National Museum*

THE MAGAZINE

RICHARD W. WESTWOOD.....*Editor*
PAUL MASON TILDEN.....*Assistant Editor*
JULIAN D. CORRINGTON.....*Microscopy Editor*
SIMONE DARO GOSSNER.....*Astronomy Editor*
E. LAURENCE PALMER.....*School Editor*
HOWARD ZAHNISER.....*Book Editor*
EDNA HOFFMAN EVANS.....*Photography Editor*
RUTH BACHMAN.....*Poetry Editor*
HARRY E. RADCLIFFE.....*Business Manager*
LAURENCE E. CROSBY.....*Advertising Manager*
LAURENCE LUSTIG.....*Art Consultant*

ADVERTISING OFFICES
New York 71-4673 Delafield Ave. Kingsbridge 8-5602. Washington 6-1214 16th St., N.W. DIstrict 7-3259

SUBSCRIPTION RATE
**NATURE MAGAZINE** is published monthly, October to May, inclusive, bimonthly, June to September, inclusive, by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D.C., U. S. A., and accepted for mailing purposes at the special flat rate of postage provided for in the United States Postal Act of October 3, 1917, and February 28, 1925. U.S. and Canada one year, $5; foreign, $.50 extra; two years, $9; life, $100.

Publication and Editorial Office, 1214 16th Street, N. W., Washington 6, D. C. Additional office of publication, Easton, Pa.

Copyright, 1958 by American Nature Association, Title Registered U. S. Patent Office. Printed in the United States.

**Nature Magazine, past and present, is indexed in The Reader's Guide in your public library.**

# Open Wider Windows On The Living World

WITH THIS TIMELY OFFER FROM

# The Natural History Book Club

## ANY TWO FREE OF THESE BOOKS

**With Your First Membership Selection.**

FROM THE MOMENT THE *SPUTNIKS* AND *EXPLORER* sent out the space signals heard 'round the world, membership in the Natural History Book Club has risen at an extraordinary rate. A knowledge of Geophysics and the other Natural Sciences must — from now on — be the property of every informed American man and woman.

That is exactly what membership in the Natural History Book Club gives you. Month by month, you will receive informative books of gripping interest, intensely readable and highly knowledgeable. Each such book is the work of an authority in his chosen subject, and *every* book will open a wider window on the universe around you.

THROUGH MEMBERSHIP, you may project yourself into Space with Willy Ley—acknowledged as America's foremost expert on the subject. Orbit about the Earth in his authoritative and definitive book, *Rockets, Missiles and Space Travel.* Or, in *To Hidden Depths,* live with Captain Philippe Tailliez amid the wonders of the underwater sea, equipped only with fins and aqualungs while you share this twilight zone with sharks, whales, giant morays and octopi. Delve into the mysteries of the "Abominable Snowman" as described by Dr. Maurice Burton, a phenomenon so intriguing that *right now* two expeditions — one Russian and one American — are seeking this rumored man-like monster in the mountains of Afghanistan and the wildest Himalayas. We sincerely believe that this Club makes a genuine contribution to a more informed Society. And — most especially — we offer it to those families who believe their children should be exposed to richer fare than comic strip learning.

**ROCKETS, MISSILES AND SPACE TRAVEL**
*by Willy Ley*

Newly revised and enlarged edition brought thoroughly up to date. The definitive source book in its field, by America's foremost authority.
Retail Price—$6.75

**THE ANATOMY OF NATURE**
*by Andreas Feininger*

Strikingly beautiful and revealing photographs illuminate a brilliant text unveiling the facts of life within Nature's cycle.
Retail Price—$5.95

**THE ATLANTIC: History of an Ocean**
*by Leonard Outhwaite*

Combining history, geography and oceanography, here is a continuously interesting book spanning the Atlantic story from earliest times to the present.
Retail Price—$6.50

**TO HIDDEN DEPTHS**
*by Capt. Philippe Tailliez*

Fascinating, intimate account of underwater exploration, with 12 amazingly beautiful photographs in full color, and almost 50 in monochrome.
Retail Price—$5.00

**EXPLORING AMERICAN CAVES**
*by Franklin Folsom*

The history, geology, lore and location of the last "unexplored frontiers". An exciting account of the men and women who light their way beneath the earth's crust.
Retail Price—$5.00

**THE WILD HUNTERS**
*by Gene Caesar*

Exciting and suspenseful account of the wild predators of America, their intelligence and social organization, with true narratives of almost unbelievable exploits.
Retail Price—$3.75

**THE PURSUIT OF SCIENCE IN REVOLUTIONARY AMERICA**
*by Brooke Hindle*

The little-known story of the first daring men who introduced the knowledge of the sciences to the colonies.
Retail Price—$7.50

**MAN AND ENERGY**
*by A. R. Ubbelohde*

A profound study, by a world-renowned scientist, of the use of energy through the ages, and the fundamental changes brought to modern life by new methods for its release.
Retail Price—$5.00

**THE WONDER OF SNOW**
*by Corydon Bell*

This fascinating book penetrates the mysteries of nature's most spectacular phenomenon — and its influence on mankind throughout the world.
Retail Price—$5.00

**ANIMAL LEGENDS**
*by Maurice Burton*

Amazing facts and some fancies about the acts of animals, extraordinary incidents based on evidence. A revealing and informative treasury of Nature lore.
Retail Price—$4.95

## FREE! . . . ANY 2 BOOKS IF YOU JOIN NOW

As your introduction to the benefits of the Natural History Book Club, we urge you to select any two of the excellent books on this page — FREE — along with a third as your first Club selection. You pay only the special Membership price of $3.89 plus postage. And the total retail worth of the THREE BOOKS can be over $20.00.

Membership entitles you to The Natural History Book Club *News* FREE. Each month, this publication describes the new selection, as well as other fine books which are available. If you do not desire the selection, you simply notify us on a form which is always provided. Your only obligation is to accept as few as four selections in the first year. After that, with the purchase of each additional four selections, at special Membership discounts—you will receive a valuable bonus book FREE.

Selections are limited. We ask that you make your choice early. Check the TWO FREE books you desire, and make your first Membership Selection now. Send no money. We will bill you $3.89 for ALL THREE after you have received the books.

**THE NATURAL HISTORY BOOK CLUB, Dept. 9012**
**11 East 36th Street, New York 16, N. Y.**

Please enroll me as a Member and send the THREE BOOKS I have checked. Two are my FREE GIFT for joining and my third is my first Membership selection. I will pay you $3.89 plus postage. I can accept as few as four selections in the first year — all at Members' discounts. For every four additional selections, I receive a valuable bonus book FREE.

- ☐ Rockets, Missiles and Space Travel—306
- ☐ The Anatomy of Nature—1152
- ☐ To Hidden Depths—1201
- ☐ The Atlantic: History of an Ocean—1241
- ☐ Exploring American Caves—1133
- ☐ Animal Legends—1237
- ☐ The Wonder of Snow—1184
- ☐ Man and Energy—1077
- ☐ The Pursuit of Science in Revolutionary America—1085
- ☐ The Wild Hunters—1238

**PLEASE NOTE:** A "Double Selection"—or a set of books offered to members at a special combined price—is counted as a *single book* in reckoning Bonus Book credit, and in fulfilling the membership obligation.

MY NAME_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

# Nature IN PRINT

By HOWARD ZAHNISER

**Conservation, Three Views**

"CONSERVATION IS A VITAL PART of what we have to offer to a distracted world that is in need of a better way of life and a better hope of peace," writes David Cushman Coyle, near the end of his recently published volume entitled *Conservation: An American Story of Conflict and Accomplishment*—a volume that deals with approximately half a century of our history, told for the most part as a development of the influence of Gifford Pinchot. Earl Pomeroy in a curiously interesting and debonairly informative book *In Search of the Golden West*, applies a jaunty scholarship to tourism, and thus deals with America, or western America, as scenery, as resort for recreation, as wilderness for vacation. Edward Higbee, seeing our land as "an oasis of plenty in what is largely a hungry world," summarizes a survey of the land and its uses today under the title *The American Oasis* and deals chiefly with our soil resources. All such discussions, and these notably, acknowledge the now accepted ideal of conservation. David Coyle gives us a sense of the difficulties and incentives that have made the application of this ideal to public programs an intensely interesting human experience. And finally he sees this experience as significant, not only in American history but also in world affairs.

It has been especially informative and interesting to have read these three works, one after the other, and to have studied them together—Edward Higbee's remarkably thorough-going survey of all our agricultural regions; Earl Pomeroy's learned but light-hearted interpretation of our great American outdoors as so many of us see and have seen it; David Coyle's consideration of all our natural resources in terms of public programs and the determined zeal of conservationists.

### For man's good

Before the end of his first page Mr. Coyle indirectly but clearly defines his subject as "the use of government powers to promote the wise management of all basic resources for the good of man." He records that "Pinchot himself was astonished when the idea suddenly came to him as he was riding his horse in Rock Creek Park near Washington on a dull February afternoon in 1907." In its first part Mr. Coyle's "story of conflict and accomplishment" is the account of the development of this idea that Pinchot, Theodore Roosevelt, and their colleagues fifty years ago shared. His second part, called "Reaction, War, and 'Normalcy' " also is in a sense a carrying on of this T. R.—Pinchot conservation. But his third part—the longest part of the volume, comprising nine of the book's nineteen chapters—"1933 and After," is a more rounded, more inclusive discussion implemented by Mr. Coyle's own acquaintance. And the book's two final chapters—a Part Four—deal with the world and with the whole half-century of history in retrospect and in perspective. The book has, in fact, in its final fullness encompassed, in a general treatment, "the wise management of all basic resources for the good of man."

"The official installation of conservation as the central policy of the Roosevelt Administration," Mr. Coyle sees in the conference of governors called by T.R. in 1908. "Behind the scenes the conservation men—chiefly Gifford Pinchot, F. H. Newell, and W. J. McGee—prepared the agenda, chose the speakers, and wrote most of their speeches, for the ideas were new and most of the governors had no clear knowledge of them."

### Wildlife concern

In an excellent wildlife chapter in the "1933 and After" part of his book, Mr. Coyle notes that while Pinchot was emphasizing the "practical" necessity of securing the "wise use" of forests and minerals, the bird lovers were adding "a strong emotional drive" in arousing sympathy and indignation over the slaughter of birds. There were other wildlife interests too, and Mr. Coyle, in tribute to T. Gilbert Pearson, for example, points out that "the interest in wildlife has been a vital component of the conservation movement."

This component missed being recorded in the book's early exciting chapter, on "The Gospel of Conservation." The fact is that in the event itself it was missing—as far as the conservation men "behind the scenes" of the governor's conference were concerned. It has been curious, thus, to look again through the proceedings of the 1908 conference. The "syllabus" of this conference—a detailed outline that in fine print occupies four pages of the proceedings—includes not a single reference to birds or to any form of wildlife. As item "e" under the subhead "Land Laws," under "Land Resources," it does say: "*e*. Effect of creation of national forests, parks, and reserves." This is the only reference to parks. A single paper, an earnest and eloquent plea that ought never to be forgotten, was worked into the program on "one of America's greatest resources — her unmatched natural scenery," but apparently it was not on the prepared agenda. In introducing it, the presiding officer, Governor Charles S. Deneen of Illinois, said: "The program has been altered somewhat, and instead of continuing the discussion of western lands we shall hear from Mr. J. Horace McFarland, President of the American [Planning and] Civic Association."

### Intangible values

Fifty years later Mr. Coyle does not "interrupt" his book but places his discussion of "Wildlife Conservation," including "intangibles" in general, at the climax of his "1933 and After." He remarks that "so long as the standard of living actually continues to rise, it is a general principle that the importance of tangible values will necessarily diminish and that of the intangible, or sentimental, values will increase." He sees "the preservation of wild areas for land animals, birds, fish, and vacationing people" as "almost entirely a job for government, federal, state, and local," and he makes an unnamed reference to the current Wilderness Bill as evidence of "a growing demand for a general policy, under scientific direction, to find and reserve permanently many different areas of undisturbed nature." He concludes this climax chapter by

seeing in wildlife conservationists—whom the builders seemingly rejected in 1908—the fulfillment of the vision of the founders. "In one sense," he writes in the chapter's last two sentences, "those who study and defend the wild creatures have a right to call themselves peculiarly the conservationists, since they more than any others are fighting to conserve some part of the ancestral heritage in which the body, mind, and spirit of the human race were formed. These conservationists are close to the central truth that Gifford Pinchot and Theodore Roosevelt taught the people half a century ago—that all resources are parts of the web of human interests and life, to be used together with as little mutual injury as possible."

I am sure that the readers of *Nature Magazine* will thus welcome *Conservation*, (Mr. Coyle's *American Story of Conflict and Accomplishment*) as a volume written with an awareness of the intangibles of conservation.

**Tourism and wilderness**

This is true also of Earl Pomeroy's account of tourism, which discusses the wilderness preservation movement in an account that is circumstantial and is documented with quotations from George Catlin to Harvey Broome. Edward Higbee's swing about our land with an eye to its landscapes and rural beauties as well as its agricultural productiveness has also its impressive comments on the importance of our land resources for recreational values. He poignantly implies a plea for the preservation of "remnants of prairie where wildlife might roam for our observation as it did when all that country was frontier." He says that with all our millions of acres of national forests "it seems ironical that big game can be easily seen in only a few exceptional places where it does not have to compete with sheep and cattle," and he foresees that "the time will come when the national forests will be set aside for wildlife and public hunting."

Thus do special discussions of various aspects of our natural resources come more and more to include a concern with the wild creatures and with "nature" in the sense that it is regarded by most of the readers of this magazine. Hardly reviews of these volumes, which deal so interestingly with their subjects, and which might on occasion each


EXPLORING TIME

as well as

SPACE

Man stands today in the dawn of a new Age of Discovery, expectant and somewhat fearful of what the future will bring. But Discovery belongs to time as well as to space. . .Within the shadows of the past which has shaped man's present lies guidance and hope for the future. The whole enthralling record of triumph and failure, striving and achievement over countless millennia is revealed in the pages of

ARCHAEOLOGY

a beautifully illustrated quarterly magazine written by world-famous authorities especially for the layman. Includes articles, news, book reviews.

Subscription $5.00 a year, $9.00 for 2 years or for two subscriptions. No extra charge for foreign subscriptions.

ARCHAEOLOGY, Dept. M, 5 Washington Square North, New York 3, N. Y.
Please send ARCHAEOLOGY for one (two) year (s) to the following address.
I enclose check/money order for $.....
Name.....
Address.....

Published by the ARCHAEOLOGICAL INSTITUTE OF AMERICA



Living Resources of the Sea

**Opportunities for Research and Expansion**

**Lionel A. Walford. JUST OUT!** The first systematic appraisal of our knowledge of the sea and its inhabitants, with an eye to utilizing the sea's resources as an eventual answer to supplying more food to a growing world. Authoritative discussions of marine organisms, influence of environments, plankton harvesting, etc. *A Conservation Foundation Study. 23 full-page maps in two colors; 13 tables; 305 pp.* $6

Evolution: *The Ages and Tomorrow*

**G. Murray McKinley.** A significant new concept of evolution, based on the author's documented belief in the unity of mind, matter, and energy, in the purposeful drive of the evolutionary process. *"The only book I know which systematically brings new knowledge to bear upon the whole subject."* **Joseph Wood Krutch.** *275 pp.* $4

Experimental Control of Plant Growth

**Frits W. Went. ALSO NEW! . . .** The famous Earhart "Phytotron" with details on its construction, operation, and the methods used to maintain a relatively germ-free and light, heat, and humidity controlled environment. Includes the results of experimentation on specific plants and offers a general discussion of the phenomena of controlled experimentation in the broad physiological and ecological categories. *A Chronica Botanica Publication, Contributing Authorities. 91 ills., tables; 373 pp.* $8.50

*Order your books from:*

THE RONALD PRESS COMPANY
15 East 26th St., New York 10



5 POWER ILLUMINATED MAGNIFIER

$2.98 POSTPAID less batteries

Built in light. For all examinations: insects, gems, stamps, etc. Also 10 power, only $3.98 ppd. Uses standard batteries.

ARLO PRODUCTS
Dept. S
66 West Merrick Road, Valley Stream, New York



Free to WRITERS

seeking a book publisher

Two fact-filled, illustrated brochures tell how to publish your book, get 40% royalties, national advertising, publicity and promotion. Free editorial appraisal. Write Dept. NM-4

Exposition Press / 386 4th Ave., N.Y. 16

be profitably discussed at length, these comments rather are indicators of a special interest and suggestions that here are three volumes well worth attention on this page, for they consider their own particular concerns with an awareness of ours.

*Conservation: An American Story of Conflict and Accomplishment.* By David Cushman Coyle. New Brunswick, N. J.: Rutgers University Press. 1957. xii + 284 pp. (5⅝ by 8½ in.), with foreword by Morris Llewellyn Cooke, 20 photographs on 12 plates, and index. $5.

*In Search of the Golden West: The Tourist in Western America.* By Earl Pomeroy. New York: Alfred A. Knopf. 1957. xii + 233 + viii pp. (5¾ by 8⅝ in.), with 25 photographs on 19 plates, note on the sources (and many source references in footnotes), and index. $5.

*The American Oasis: The Land and Its Uses.* By Edward Higbee. New York: Alfred A. Knopf. 1957. xviii + 262 + viii pp. (5¾ by 8⅝ in.), with foreword by Fairfield Osborn, map showing areas of generalized soil erosion in the United States, 29 photographs on 15 plates, selected bibliography, and index. $5.

**Water**

*By Ivah Green. New York. 1958. Coward-McCann, Inc. 96 pages. Illustrated $3.50.*

Taking as his theme the fact that water is our most valuable resource, the author presents a popular story of water, using excellent and profuse illustration to prove his points. Mr. Green has succeeded in compressing into lively text information about whence water comes, where it goes, how it should be wisely used, what results from too much and too little water, the effects of pollution, water in relation to trees and wildlife, and water for recreation. This is a most useful book.

Elizabeth Ingles

## OUR AUTHORS FOR APRIL

Bernard L. Gordon

**Dr. Wilfred T. Neill is associated with E. Ross Allen in the scientific work carried on at the E. Ross Allen Reptile Institute in Silver Springs, Florida. . .August Derleth, of Sauk City, Wisconsin, is a veteran writer who, in thirty years, has produced more than eighty published books and scores of magazine articles, fiction stories, essays and poems; he is the editorial director of Arkham House, publishers, of Sauk City. . .Elizabeth Ingles is dean of girls at Roosevelt High School in Fresno, California, a student of animal behavior and writer of articles with a Nature interest. With her husband, a mammalogist, and her young son, she has traveled extensively in Mexico and the Central American Republics. . .Philip Brady, newspaper and magazine article writer, conducts a copy and planning service in the advertising and public relations field at Dedham, Massachusetts. . .Helen M. Kovar, one-time language teacher and librarian, lives at State College, Pennsylvania, with her two little girls and her ecologist husband, who is a teacher and research worker for the department of botany at Pennsylvania State College. . .Norman Pietan, until recently an assistant professor and photography teacher at Mills College in Oakland, California, sees plants as subjects that excite both the naturalist's interest and the photographer's pursuit of artistic design . . . In the old art colony of Woodstock, in the Catskill Mountains of New York, lives Eva Beard, author of articles on horticulture, conservation, and other subjects, and a student of the early naturalists of America. . .Bernard L. Gordon is a biology instructor at the Rhode Island College of Education in Providence, a free-lance writer and photographer now occupied in a taxonomic survey of the marine fishes of Rhode Island waters. . .Alvah Peterson is a professor of entomology at Ohio State University and author of a recent handbook about insects that are useful as bait, under title of "Fishing With Natural Insects."**

**Robins of the Window Sill**

*By Irmengarde Eberle. New York. 1958. Thomas Y. Crowell Co. 44 pages. Photographs by Myron E. Scott. $2.75.*

Nesting robins and their family affairs are perhaps observed by more people than witness the intimate details of the lives of other birds. And many fine pictures have been made of robin home life. One such group of photographs were done by Myron Scott when he was art director of the *Dayton* (Ohio) *Daily News.* They record the redbreast story, from mating and nest building to the launching of the youngsters. Around this picture series Miss Eberle has woven an entertaining story for younger readers.

**Briefly Noted**

*The Healings of The Bible. Compiled by Nellie B. Woods. New York. 1958. Hawthorn Books. 96 pages. $2.50.* A record of the healings recorded in both the Old Testament and the New Testament.

*Outdoors with Gus. By Norman Wagner. New York. 1957. Pageant Press. $3.00.* Gus is the creation of the artist, Norman Wagner, and he is a means to a delightful spoofing of hunters and fisherman.

*Buzztail. By Robert M. McClung. New York. 1958. William Morrow and Co. 64 pages. Illustrated by the author. $2.50.* A story for youngsters about a rattlesnake.


TWO BOOKS by Norman C. Fassett

A MANUAL OF AQUATIC PLANTS
The manual covers the region from Minnesota to Missouri and eastward from the Gulf of St. Lawrence to Virginia, and is illustrated by over 200 full-page line drawings and numerous smaller drawings and photographs. While the basis for treatment is subjective, entries themselves are exhaustive, with particular emphasis on keys and illustrations.

406 pages $6.50

SPRING FLORA OF WISCONSIN — A Manual of Plants Growing Without Cultivation and Flowering Before June 15
A work of interpretation, not written for specialists as such, the author has presented his own wide knowledge in a form which can be understood and put to use by anyone with a real interest in Botany. A completely revised edition.

200 pages $2.50

The University of Wisconsin Press
430 Sterling Court Madison 6, Wisconsin

# Contents noted BY THE EDITOR

**NATURAL RESOURCES AND THE PEOPLE** are the dual concern of Ernest Swift in a booklet to which he gives the title "The Glory Trail." Ernie, who is executive director of the National Wildlife Federation, gave us the opportunity to read in advance the manuscript of this publication. It was his conviction that few of the books written about natural resources consider them from the viewpoint of their relation to people and the historical relation of people to the resources that they used—and abused—in the course of making American history. So Ernie Swift set out to write what he describes as "a panorama of motivation and action; a picture that must be viewed from a distance to appreciate the restless ebb and flow of humanity and the fabulous wealth of empire that we claim as our heritage." This ever-stimulating conservationist hopes that his booklet will "arouse an intellectual curiosity for resource history." Certainly it should do that, and, in our opinion, this publication would make exciting collateral reading for the high school student studying the history of America, as well as worthwhile reading for anyone thinking in terms of our history and our natural resources, separately or together. The Federation, 232 Carroll Street, N. W., Washington 12, D. C., offers single copies of "The Glory Trail" free, with a modest price, well within the reach of any school board, for quantity orders.

**FED UP WITH BILLBOARDS? GO TO DENMARK.** Billboards began to appear in Denmark in the 1930s, and the Danes, being a tidy people, reacted quickly to the invasion. In May, 1937, a law was passed prohibiting billboards except on streets, roads and plazas in cities. The only exception was in cases where the sign related to a vocation or business conducted on the premises. Existing signs were given one year's grace from the date of the law. The law describes billboards as "all posters, pictures and separate billboards and other devices used for advertising." Although northern Italy is infested with roadside signs to a degree almost comparable to our own situation, the Rome municipal council recently took strong action to curb billboards that were competing for attention with the city's ancient attractions. On the whole, visitors returning from abroad are impressed with the respect for the countryside in Europe.

**PROGRESS OF CIVILIZED MAN** in Bluffton, Ohio, is recorded by the *Bluffton News* on evidence provided by the Bluffton Sportsmens Club. One recent Sunday afternoon after church, four pickup trucks loaded with some sixty hunters repaired to nearby farms. Selecting one section of land, the hunters covered all four sides, than, on signal, converged on the center of the section. The object was to stir up a fox, get it within the converging ranks of the hunters, and kill it. Three red foxes were thus eliminated on one Sunday "hunt" over six sections of land. Two Sundays later one gray fox was raised, but it took refuge in a woodchuck hole, where it was finally found by digging three feet deep. It was planned to dynamite if necessary to kill the animal. That Sunday eight pickup trucks carried the intrepid hunters. Sixty, or eighty, men armed with shotguns against one fox! Sport?

**SWARMING FIELD MICE IN OREGON'S** Klamath Basin have a certain basic, if not geographical, relation to the fox vendetta in Ohio. Foxes eat mice, as do coyotes, hawks and owls, and other creatures Nature provides for her population controls. Whether it was the cumulative result of predator extermination or not, the mice appeared in such numbers that they stripped the fields of food planted for the special benefit of migratory waterfowl. They also gobbled farmer's crops and perforated ditch banks in a way to make water control difficult. Poisons were spread widely but did not seem to check the rodents. Lacking food, the waterfowl did not linger in this normal resting place on the Oregon-California border. "Ironically," observes a release of the Wildlife Management Institute, "many disappointed waterfowl hunters are said to have blasted away at the large number of hawks and owls that were attracted by the army of mice." Again we ask—Sport?

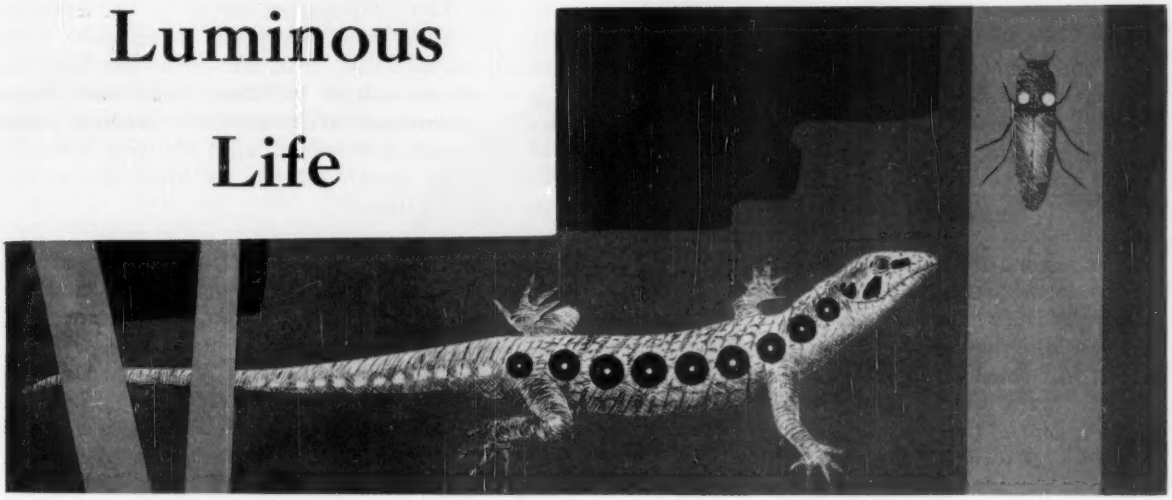
**FORTY-SIX YEARS AS A "PARK MAN"** is the distinguished record of John W. Emmert, who has retired as superintendent of Glacier National Park. In fact, John Emmert antedates the National Park Service itself by five years, having taken a post as assistant electrician at Yosemite in 1912. He rose in the Service to be assistant superintendent of Yosemite and served in both Yellowstone and Hot Springs until his appointment to Glacier in 1944. A dedicated servant of the National Parks, Mr. Emmert received the Distinguished Service award of the Department of the Interior for his work in connection with exchange of lands perfecting the boundaries of Glacier, incidentally our favorite park. Superintendent Emmert will settle in Coeur d'Alene, Idaho, where he owns a home, and thus will not be far from the area over which he has presided so many years. No dyed-in-the-wool National Park man ever really retires, and with the longest record of service in the entire Service, John Emmert, no doubt, will be no exception. As co-owners of the national Parks, we owe him a word of thanks on a job well and loyally done.

R.W.W.

PHOTOGRAPH BY NEW ZEALAND NATIONAL STUDIOS

The larva of the New Zealand crane-fly, *Arachnocampa luminosa*, dwells on the ceiling or wall of large caverns, where it spins a web from which sticky threads dangle. At intervals, the larva flashes its bright light, which attracts midges that breed in the pools of water of the caves. Many of the midges are ensnared by the sticky threads, and are then hauled up and eaten by the larva. New Zealanders are proud of their "glow-worm" caves, many of which have become tourist attractions, and the winking of the insect lights in the blackness of the caves is a sight well worth seeing.

# Luminous Life



A lizard of Trinidad, *Proctoporus shrevei*, is suspected of luminosity. Here it gazes at a West Indian click-beetle with glowing spots on its thorax.

By WILFRED T. NEILL

*Illustrations by the Author, unless otherwise credited.*

ON A BLACK, rainy night in 1943, in the Uberi country of New Guinea, I paused beside a jungle trail to take a compass reading. I was squinting at the luminous dial of a "G.I." compass when, out of the corner of my eye, I glimpsed nearby a brighter luminosity—a dozen spots of greenish light, softly glowing in the blackness. The spots were perfectly circular, the smallest no bigger than a dime and the largest about the diameter of a fifty-cent piece. At closer range, I saw that each emerald light was surrounded by a nimbus of blue, deepening to violet at its outer edge. Bringing my face to within a foot of the luminous objects, I could identify them by their own glow. They were mushrooms, a whole colony of them, sprouting from the soggy pulp of a rotten log. I put several of the funguses in a tin can, and found that I had a passable flashlight, adequate for reading a map.

This was my first experience with the luminous mushrooms of the tropics. Years later, on other jungle islands, I saw other species, glowing orange, yellow, green or blue. More than fifty kinds of fungus are known to emit light, in some cases from the whole plant, but in others from just the cap or the stem or the gills. And there are some non-luminous species that give off clouds of glowing spores.

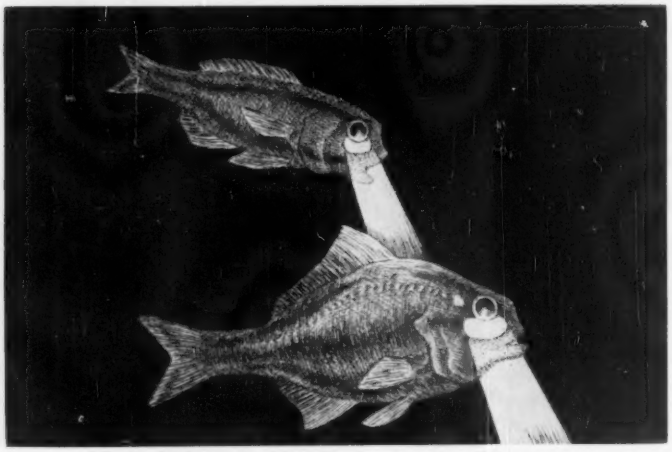
A few phosphorescent mushrooms live in temperate regions. A European species, which springs up beneath olive trees, was imported into California, where its orange-yellow light may be seen in the groves. A fine luminous mushroom, often five inches across, grows on rotting hardwood stumps in the United States. Called Jack-o'-lantern, it gives off orange light also. Both of these funguses are poisonous if eaten. Like the deadly Amanitas, they produce gastro-intestinal upset, nervous disability, convulsion, delirium and perhaps death.

On another rainy night, ten years and 10,000 miles away from New Guinea, I followed another woodland trail, this time in the Appalachian Mountains. I flicked my lamp off for a moment, and on a little rocky shelf, inches from my face, numerous tiny lights began to glow. These were not mushrooms, not plants at all, but the larvae of a fungus-gnat which scientists call *Platyura fultoni*. Most fungus-gnat larvae dwell in leaf mold, feeding upon decaying vegetation and mushrooms; but not so Platyura, whose larva spins a web across little holes and crevices of the rock to entrap tiny insects. Lurking beside its web, it flashes a bright lantern from time to time. Apparently, some little insects are attracted to this lure, like moths to a flame, and so fall prey to the carnivorous Platyura.

Even more remarkable than the Appalachian fungus-gnat is a New Zealand crane-fly, *Arachnocampa luminosa*. Its larva dwells on the ceiling or the wall of some large cavern. Here it spins a web, from which dangle sticky threads. Motionless beside the web, Arachnocampa flashes brilliantly at intervals. In the cave there are always pools of water; and certain tiny insects, called midges, breed in them. When the aquatic midge larvae transform into their winged adult stage, they are attracted by Arachnocampa's gleam, and many of them are ensnared by the sticky threads. Arachnocampa then hauls in the thread and devours its prey. Curiously, the

light of Arachnocampa is produced by four Malpighian tubules, which normally are excretory organs—the insect equivalent of kidneys. New Zealanders are proud of their luminous larva (which they call "glow-worm"), and Arachnocampa caves often become tourist attractions. Thousands of these insects, winking on and off in the blackness overhead, are a sight indeed worth seeing.

Arachnocampa also is remarkable in being the only luminous cave-dweller. Glowing lights are sported by many creatures from the black depths of the sea, and one might expect luminous life in the eternal darkness of caves, also; but Arachnocampa stands alone in this regard. A minute fungus, which causes the well-known "fox-fire," may grow on timbers in deep mines, but it does not have to live in such places, and is just as apt to be found on rotting stumps in the woods. The young of certain cave-nesting birds have gleaming spots, called



Two of the glowing goblins of the southwest Pacific are *Anomalops* (at top) and *Photoblepharon*. Their "headlights" harbor luminous bacteria.

reflection pearls, about the mouth; but these spots, like the eyes of a cat, merely reflect the available light, and are not luminous in themselves.

New Zealand also can boast of the only luminescent, fresh-water organism. It is a mollusk, a limpet called *Latia neritoides*, found in streams and ponds. There are, however, some glowing bacteria that can live in fresh water as well as in other places; and the aquatic larvae of certain fire-flies gleam beneath the surface of pools and puddles. Luminous life does not exist in the black depths of the larger freshwater lakes, although some, like Tanganyika in Africa and Baikal in Russia, are close to 5000 feet deep.

No, it is to the sea we must go for the most impressive displays of bioluminescence—living light. Almost everyone has seen pictures of weird deep-sea fishes, decorated with glowing spots in elaborate arrangement. Less familiar are luminous jellyfishes, comb-jellies, hydroids, sea-pens, brittle-stars, sea-worms and crustaceans. Two octopuses, one sea-fan and one sea-squirt also gleam. A giant pycnogonid, or sea-spider, fully twenty inches across, emits blue-green light from the under side of its legs. A free-swimming snail, transparent and without a shell, can flash at numerous points on the surface of its body. Called *Phyllirrhoe bucephala*, this delicate creature inhabits the Mediterranean and parts of the Atlantic.

One of the luminous sea-worms has an amusing habit. When seized by a fish it promptly breaks in two. The tail end—which is expendable—immediately flashes its very brightest, and generally attracts the fish's attention, while the head end darkens and sneaks away.

Squids, those ten-armed allies of the octopus, rival the deep-sea fishes in their displays of living light. A squid called *Lycoteuthis diadema*, which dwells at depths of nearly 10,000 feet in the Indian Ocean, glows with spots of dark blue, sky blue, pearly white and ruby red. Another squid, *Heteroteuthis dispar*, found deep in the Mediterranean, gives off a luminous secretion when disturbed. A fish, thinking to make a meal of Heteroteuthis, finds itself engulfed in a cloud of liquid flame, and immediately takes a different view about the edibility of squids. Of course, the glowing cloud is not actually hot. All luminescent creatures produce "cold light," through chemical processes that give off extremely little heat. Incidentally, some biologists think that the secretion of Heteroteuthis may glow because luminous bacteria live in it.

American soldiers stationed near Toyama Bay, Japan, may be fortunate enough to see the annual haul of "fire-fly squid," *Watasenia scintillans*. Each year, the Japanese net about a thousand tons of these luminous mollusks from the bay, and use them to fertilize nearby fields.

The ocean provides a display of phosphorescence, not only in its depths, but also at the surface—and in our own waters. Along the Florida coasts, and sometimes farther north, the whole sea appears to glow by night; every breaker is crested with a million coruscating droplets, and the darting fishes leave refulgent wakes. On many a black night I have stood in the bow of a ship to watch the spectacle. As the waves are parted, they glow a soft green; as they are tumbled back along the hull, they shine more brightly; and when at last they are churned by the racing propellors, they erupt into brilliant flame. Behind the ship a radiant trail recedes into the blackness. Passengers may speak knowingly of dissolved phosphorus, or of electrical discharges; but the light is really produced by microscopic animal life—millions of tiny organisms drifting at the surface of the sea. The commonest of these protozoans bears the name of *Noctiluca miliaris*. Beneath the microscope, it resembles a pearl with a pigtail. When jarred, touched, or otherwise disturbed, it flashes briefly. In warm seas, Noc-

tiluca and its allies multiply so bountifully that they give the water a pink tinge by day, and illuminate vast expanses of the sea at night with their display of light.

The sea is inhabited by more light-emitting organisms than could ever be described here. However, no account of bioluminescence should neglect a small fish called *Photoblepharon palpebratus*. This fantastic creature dwells in the Banda Sea, west of New Guinea and south of Ceram. Beneath each goggle eye, Photoblepharon has a large glandular structure, richly supplied with blood vessels. In this organ, certain luminous bacteria live and multiply. These bacteria are always aglow, lighting the fish's path through the dark waters.

Tropical mushrooms, mostly of the genus *Mycaena*, glow orange, yellow, green or blue, according to species.

It might be noted here that all luminous plants—and these include only certain bacteria and funguses—glow constantly. (A rare moss, *Schistostega pennata*, and an alga, *Chromophyton rosanoffi*, are sometimes called luminous, but they merely reflect available light from lens-like cells.) In contrast, only one animal continuously emits light, this being a Brazilian beetle called "railway bug" on account of its numerous glowing spots. All other luminous animals flash intermittently, in response to some external or internal stimulus. Photoblepharon, although provided with constant bacterial glow, yet can "turn off its headlights" when the need arises; for its light-organ is equipped with a movable fold of black, opaque skin that can be raised like a shutter. In a related fish, *Anomalops katoptron*, which also utilizes bacterial glow, the light-organ is hinged, and can be retracted into a pocket when black-out seems warranted.

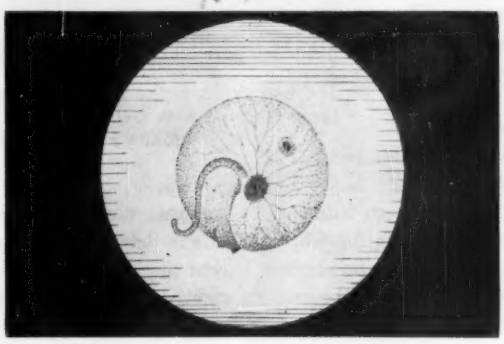
In both Photoblepharon and Anomalops we see a remarkable instance of cooperation in Nature; the fishes are provided with a light, the bacteria with a home in a rich nutrient medium. The native peoples of the Banda Sea also profit by the arrangement, for they catch Photoblepharon, cut out its light-organ, and use it as bait for larger fishes. Thus the luminous bacteria serve two purposes.

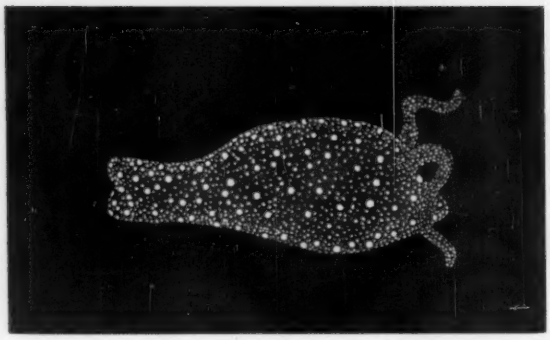
Luminous bacteria figure prominently in Nature's scheme. Some kinds live upon decaying flesh. Harmless, they do not bring about the decay, but simply take advantage of it, and will not attack healthy tissue. Before the days of antiseptic medicine, soldiers injured in battle sometimes were astonished to find their wounds glowing at night, and surgeons noted that such wounds healed faster than any others. The same bacteria often bring a glow to pieces of meat or dead fish; I have seen a photograph of dead herrings taken solely by the fishes' bacterial light. But other luminous bacteria are deadly, at least to small organisms. Certain mayflies, midges, mole-crickets, caterpillars, sand-fleas and freshwater shrimp are known to be attacked by "luminous disease." The parasitic bacteria multiply and spread throughout the tissues of the host. For a short while, the infected animal emits an eerie glow; then it dies.

Luminous bacteria have both helped and hindered the scientists who study living light. Helped, because these microscopic plants are easily reared and studied in the laboratory; hindered, because they sometimes live in, or upon, a creature that has no light of its own, and so confuse the issue. There are reports of a luminous spider in Burma, of phosphorescent termite hills in Brazil, of hens' eggs that glowed in the dark; there are even a few accounts of human beings with luminous body fluids. And it is amazing how many people, in several different countries, claim to have seen night-shining owls and herons. Perhaps bacteria are involved in these cases of misplaced luminosity, but of this no one is certain.

For some years I have directed a research program for the Ross Allen Reptile Institute at Silver Springs, Florida, and thus have been especially interested in the puzzling reports of a luminous lizard. Called *Proctoporus shrevei*, this reptile inhabits caves and other dim places on the upper slopes of Mount Aripo, in Trinidad. It is a small lizard, related to our familiar racerunners and whiptails. The male Proctoporus has about nine deep-black spots along the side of the body, and in the center of each maculation is a glistening bead-like dot, really a translucent window in a curiously modified scale. A scientist examined the structure of these scales, and concluded that the windows were either reflecting or light-emitting organs. Independently, a naturalist made observations on a living Proctoporus in its natural habitat. According to his account, on two occasions the reptile's "portholes" flashed briefly with a pale green light. Next, an authority on living light expressed the opinion that no lizard could be self-luminous; that the organs of Proctoporus must be comparable to the reflection pearls of certain birds.

One of the commonest luminous protozoans is *Noctiluca miliaris*, which resembles "a pearl with a pigtail," and illuminates vast expanses of sea.





*Phyllirrhoe*, a translucent snail of the Mediterranean, presents a delicate pattern of luminous dots.

There the matter stands. Lizards related to this Proctoporus, and similarly marked, are widespread in South America, but nothing is known about their habits.

Indeed, much remains to be discovered about living light. Why do so many creatures luminesce? Of course, deep-sea fishes obviously profit from a lantern, Arachnocampa from its lure, the squid Heteroteuthis from its defensive cloud of liquid flame. To the nocturnal fireflies, a light is doubly useful. Not only does it enable the sexes to find each other in mating time, it also gives warning of inedibility; for these insects are extremely distasteful to some predators. (But not to all predators; a biologist visiting Cuba was astonished by a glowing toad, until he observed that the amphibian had stuffed itself on fireflies!) A naturalist in Borneo once saw a gecko seize a firefly; when the insect flashed, the lizard released it and scampered off as though badly frightened. But why should a marine rock-clam, *Pholas dactylus*, have glowing spots, when it lives in a hole bored deep into solid rock? Why should a worm, *Chaetopterus pergamentaceous*, be luminescent, when it never emerges from a parchment-like tube in the mud of the sea bottom? Of what use is light to the fungus that produces fox-fire on decaying wood? Why should some glowing bacteria have brilliant, dim, and completely dark strains; and why should a mushroom, *Panus stipticus*, emit light in America but not in Europe? What strange impulse causes thousands of tropical fireflies to gleam simultaneously, thus briefly illuminating vast stretches of jungle? Does the juice of a Brazilian spurge, *Euphorbia phosphorea*, really glow in the dark? And is it true that the spathe of the Pandanus flower splits open with a crackle and a flash of light? These and other questions remain unanswered; for the present we can only marvel at the wonders of luminous life.

# The Sentries

By BETTY JOHN

*Photograph by the Author*

The two storks in the photograph above may well have been among those credited with saving the lives of the people of Aggaia, Greece, during a destructive earthquake there.

A few months after a train trip from Thessalonica to Athens, Greece, I read of the extensive earthquake that hit the area around Aggaia. Much damage was reported, but not one death or injury. The people, it is said, owed their lives to the many storks that nest on their rooftops. The earthquake came at that time of mid-day when everyone naps indoors for two or three hours, to avoid laboring in the intense and relentless sun. The storks evidently sensed the trouble before it had become apparent to human beings, and had flown up in the air, excitedly flapping their wings, circling their nests, and crying out with raucous, frightened screams that awakened the villagers. The people all ran outdoors to find out what the disturbance was about, just in time to escape being buried in the debris of their toppled homes! I like to think that the two storks that had so obligingly posed for my camera, when our train stopped at Aggaia, were among the saviors of their village.

PHOTOGRAPH BY CHARLES S. SCHWARTZ

The whippoorwill is a hardwood forest dweller that many people hear, but not so many see. It is abroad only during the night hours, and during the daytime, when it sleeps on the forest floor, its plumage blends remarkably well with the dead leaves and litter of the woods. Country dwellers within the range of this bird can attest to the persistence of its calling.

# Call of the Whippoorwill

By AUGUST DERLETH

More than thirty years ago, I read of how John Burroughs had counted an unbroken succession of whippoorwill calls to the number of 1088. That total challenged me. Then and there, I determined to make the attempt to establish a record in excess of Burroughs' total, since, living in the heart of south-central Wisconsin, along the wooded slopes of the banks of the Wisconsin River, I could hear whippoorwills from late April into late September.

From that year on, I took every opportunity to go into the country to listen to whippoorwills. As a boy, I walked; later, friends drove me out in their cars; and finally, I drove my own. I became a familiar figure on the roads and lanes around Sac Prairie, and my interest in whippoorwills was widely known—a circumstance that had the happy result of bringing me a great deal of information about the bird.

I soon had reason to believe, for example, that the whippoorwill returns to its nesting grounds in Wisconsin well before it begins to call. I had the help of country dwellers in fixing early and late dates for the calls, thus expanding my listening time considerably, although I, myself, never heard whippoorwills earlier than April 21, or later than October 2. But one spring night in 1945, while driving with two friends along a little-used road bordering the marsh country along the Wisconsin where Honey Creek joins it, I saw in the glow of the headlights, sitting in the road before the car, the year's first whippoorwill. I got out of the car, and was able to approach to within four feet of it before the bird noiselessly took wing. The date was April 13; and that year, the first calling date was April 27.

But the number of consecutive calls remained depressingly low. I could record 451, 823, 647, 238—any imaginable combination of numbers under 900 was relatively easy to achieve in any one season. And the seasons slipped inexorably past. Five—ten—fifteen. I could not reach 900 consecutive calls, although I doggedly continued to try. I studied the bird day and night, whenever leisure permitted. I found nests, watched eggs, observed the hatching and training of the young birds.

Within certain limitations, I became a modest authority on whippoorwills. When a popular novelist described the calling of whippoorwills by day, I could testify that this nocturnal singer does, indeed, call in

The whippoorwill makes no attempt to build a nest. The two eggs, cream-colored with lavender splashes, are laid on the floor of the forest, where they blend nicely with the subdued colors of fallen leaves.

PHOTOGRAPH BY CHARLES S. SCHWARTZ

These two chicks are protected from marauders only by their neutral coloration. They belong to the family of birds known as goatsuckers, from the early belief that the ample mouths of adults were employed in sucking milk from goats.

PHOTOGRAPH BY LEWIS W. WALKER

broad daylight—but only, evidently, when disturbed at, or near, its eggs or young in the nesting season. I never heard a whippoorwill call by day except in such circumstances, and usually not even then. The bird's usual habit is to fly soundlessly from the nest, and settle not far away until the intruder has passed.

Always, I continued to clock the calls. Some of the birds were rapid callers, and some slow, measured callers. I even developed a certain facility for counting the calls of more than one bird at a time. All to no avail. My goal eluded me, and, as the years passed, it began to seem unattainable. Burroughs' 1088 consecutive calls assumed the proportions of a monumental achievement to one who, over a period of many years, had listened to thousands of birds in every kind of local terrain—hill country, wooded valleys, river bottoms, meadows, marshland, and the terraced fields and pastures that are called prairies in the valley of the Wisconsin.

Circumstances seemed to conspire against me. I lost the summer of 1953 on a honeymoon in California, which turned into an extended period of lecturing, teaching, and writing scenarios. The summer of 1954 threatened to curtail my listening activities permanently. Our daughter, April Rose, was going to be born that summer; and after her birth, my activities would be more limited, for my wife, who had become my faithful listening companion, could no longer accompany me.

It was in a mood of understandable resignation that I set out on the night of June 16, with my wife, on the inevitable listening journey. We went first to the Honey Creek country, where our highest count was only 161. We went on into Skunk Hollow not far away, a little pocket of self-sufficient farms, surrounded by woodland, and reached a total of 242. We went into the hills—into the marshes—down along the river. We achieved no total of consecutive calls higher than 447. We turned back home. The goal I had sought for so long seemed now, at last, to have retreated beyond the far horizon, beyond my reach.

At home, I went at once to my desk, near the open French doors of my studio. My wife picked up a book, and settled herself to read on the lounge. It was a beautiful, soft, late spring night, aglow with moonlight. A gentle south wind blew in from the river scarcely half a mile away, over the lowland and a field of young corn beyond of my rail fence.

It was from beyond this field of corn that a whippoorwill suddenly began to call. At first the call came from faint and far away, and seemed to be simply experimental—ten consecutive calls, twenty-seven. Then the bird moved up into the field of corn, and began again. My hands dropped from my typewriter, and I started, automatically, to count. On the lounge, Sandy had lowered her book and was counting, too. The bird's voice came in on the south wind with the quality of sound heard in a dream; all else was still, save for the faint hushing of wind and the occasional crying of a killdeer, flying over the fields and pastures nearby. The whippoorwill was a consistently rapid caller. It went to a hundred, to two hundred, and three hundred. It continued to five hundred, and went on.

I began to hope that at least the bird might set a new

record for me, that its total of consecutive calls might surpass my total of 861. As it came close to 800, I rose, and went to sit directly before the French doors, where the call of the whippoorwill rang with a clarity that almost echoed in the room. We could often hear the little clucking or quirting sound preceding the call—*not* following, as Brewster recorded it in his journals.

The bird reached and passed 861. It went on. Nine hundred, even a thousand came and went. Sandy got up and came over to sit down, too, still silently counting. I was held in the suppressed excitement of anticipation, which burst forth in a great sigh of contented relief when the calls reached 1089.

But the end had not yet come. That whippoorwill did not stop until we had counted a total of 1507 consecutive calls, not broken by as much as a hair's-breadth of hesitation. The bird had begun to call at eleven o'clock; it stopped at thirty-three minutes past the hour, averaging more than 45 calls per minute.

After more than twenty years, I had exceeded John Burroughs' record! What a sense of achievement it gave me to have done so at last! And how absurd that this should be so! To think that I should have walked and ridden and driven all around the countryside for almost a quarter of a century, stopping often in defiance of mosquitoes and other insect pests to achieve this goal—and that I at last should succeed within the walls of my own home!

# Fairy Princess of Springtime

By RUTH H. DUDLEY

*Photograph by the United States Forest Service*

The showy flowering dogwood, *Cornus florida*, has a distinctive rough, checkered bark and conspicuous button-like buds on the ends of its twigs.

The flowering dogwood, *Cornus florida*, is the showy unofficial State tree of Virginia and Missouri, and its bracts provide the official State flower of Virginia.

It is a small tree, less than forty feet tall, with a trunk usually less than eighteen inches. Small though the dogwoods are as trees, they seem fairly to sweep in the spring all by themselves. They are like fairy princesses awakening ahead of most of the rest of the sleeping world.

During every season of the year this tree has its special charm. In winter its conspicuous silver-gray buds stand out from the ends of the twigs and attract attention. In the spring these open and stretch outward, first green, then turning a pure white. Unlike the usual bud scales, they do not drop off, but are petal-like bracts that become the "flower" of the dogwood. The true flower, however, is the small, greenish cluster in the center of the large white blossom.

When the bracts fall off, a cluster of fruit begins to develop, and by late summer these berries are shiny red. They stay on the tree until late in the year unless they earlier make a meal for birds or squirrels.

The leaf buds, much smaller than the flower buds, are scattered along the twigs and open shortly after the blossoms. The leaves are rose at first, turning to a glossy green. In the fall the leaves turn to brilliant reds, and the little tree seems fairly to glow in the sunlight. The rough, checkered, alligator-skin-like bark of the trunk and the usually rather flat-topped shape of the tree, with its branches spreading straight out, are helpful identification marks in the winter.

Wood of the dogwood is hard, and most of the trees cut have been harvested for the manufacturing of shuttles, mallet and golf club heads, spool and bobbin heads, tool handles, and such. A slow-growing tree, it is being cut for commercial use at a rate that exceeds its ability to produce new growth.

# Nosey Pisote

By ELIZABETH INGLES

*Photographs by Lloyd G. Ingles*

As a mature coatimundi, Nosey is about the size of a house cat, has reddish-brown, coarse fur and sparkling dark eyes.

The author and the young coatimundi "read" the evening paper together.

When the Mayan Indian put the long-nosed, bright-eyed ball of red-gold fur into our son's arms, I knew that we *had* to have her. We had seen many coatimundis in Panama, but never one so young, or as brightly colored as this. Ruis, the Indian, said it was about two months old. He had taken her from the nest in the jungle south of Merida, Yucatan, and would be glad to sell the animal for twenty-four pesos, or about two dollars.

Coatimundis are common in the dry, tropical jungles of Yucatan, as they are throughout much of Mexico and Central America. Although the animals on the peninsula are thought to be the same species as those in the rest of the range, even the adults differ in appearance. Coatis, or *pisotes*, as they are called by the natives, are close relatives of the raccoon. They have long pointed noses, relatively slender bodies, and long, indistinctly ringed tails that are held high when the animals hunt. Throughout Mexico and Central America, the animals vary slightly in color, from a dark grayish-brown to black.

In Yucatan, about forty inches of rain fall during the year, but because of the characteristics of the soil, moisture disappears from the surface almost as soon as it hits the ground. There are no surface rivers or lakes. All the water for man and beast comes from natural wells, or *cenotes*. These are simply holes where the limestone roof of a cave has fallen in, or has been dissolved away and filled with water from some underground river. Although the climate is hot in this part of Mexico, the lack of surface moisture produces a dry tropical jungle of acacias, palms, caoba, red cedars, and agaves—a jungle where most of the trees are relatively small. Everything is dense, thorny, and green, and there is much duff on the ground. There are many insects, arachnids, snakes, crustaceans, fruits, and seeds on which an omnivorous animal like the coati can feed. These animals hunt singly or in packs over the forest floor, their long sensitive noses poking into every nook and crack. When jungle fruits are ripe they take to the trees, where they are completely at ease, jumping from limb to limb or climbing rapidly up a trunk. The long tail, held curved up from the back when hunting on the ground, serves as an organ of balance aloft. When the perch is precarious, the tail is thrown from one side to the other, as needed. In this way, coatimundis are able to climb over slender branches, and can even walk across vines and wires like squirrels.

Our new long-nosed pet, promptly christened Nosey by our young son, John, was a nuisance from the start. We bought her a basket in the market at Merida, fixed it up with rags for a nest, and drove to Campeche. But the basket did not suit her, and she cried in a high-pitched voice until allowed the run of the car. She had

her long nose into everything, was busy all the time, and did not hesitate to climb up the back of the front seat and up the back of the driver's neck—an act that nearly wrecked the car and resulted in "the cat," as my husband called her, being relegated to the despised basket.

By the time we reached the hotel in Campeche, Nosey had learned how to get out of the basket. Our next move was to tie the lid down tightly with henequin string; but we felt the coati would really be safe only in the bathroom. The dining room was on the floor below, and opened on a patio. Our meal was only half-finished when we heard the high-pitched wail of our pet. From the sound, we could tell she was unhappy, rather than hurt; so we finished our dinner, momentarily expecting the manager to come and courteously ask us to pack up and leave. But Mexicans are notoriously fond of animals. When they found out what the cries were, they brought bananas and warm milk, and graciously made suggestions for her care. Nosey was no trouble to feed. She ate the bananas and milk with relish, sampled the papayas we brought her, and finished off with a good-sized moth she caught on the

A young coatimundi, *Nasua narica,* hunts over the dry Yucatan jungle floor in search of insects and arachnids.

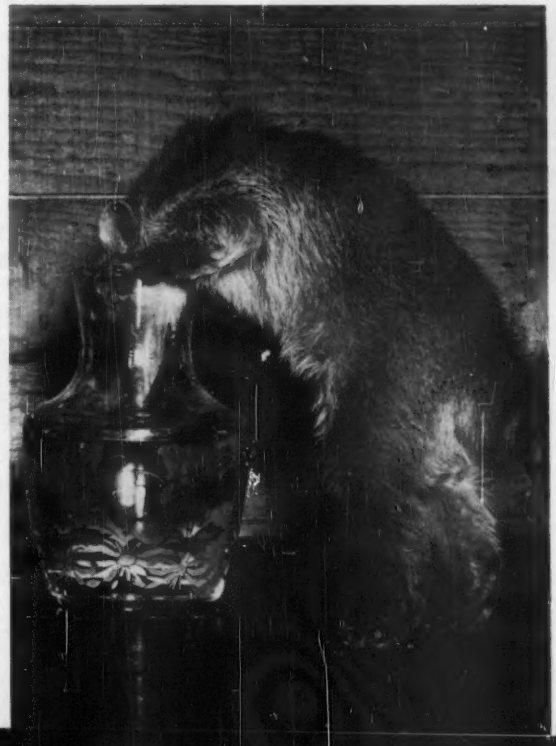
bathroom window. Hundreds of large moths were attracted each night to the lights, where they fluttered until exhausted, and fell in heaps on the floors of the porches. Each morning, the coati was taken on a leash around the porch, where she ate as many moths as her little belly would hold.

When we were ready to leave Campeche it was necessary to ship our car, and follow it by train through the Yucatan jungles; but we shuddered at the thought of taking our pet into the Pullman, and were actually relieved when the railroad officials stated flatly that Nosey had to ride in the baggage car. With some misgivings—for she had already begun to chew her basket—we tied the leash to the basket, placed the animal inside with plenty of food and water, and tied the basket securely together with the henequin string. As it turned out, there was no need for worry. Nosey cried at being left alone, and the baggageman looked inside the basket, fell in love with the little creature, and spent the rest of the trip walking her about the car, playing with her, and giving her tidbits.

Our next adventure with Nosey came in Cordoba, a town some 2500 feet in altitude on the east coast of Mexico. The hotel here was old-fashioned but pleasant, and we felt that our pet would not be unwelcome. Again, when we went to eat, there was no safe place to leave her except the bathroom. On returning from dinner, we could hear her terrified screams, and this time there was no doubt that the coati was in trouble. Nosey, gasping and shaking, was slipping beneath the water in the toilet bowl as we fished her out. Apparently, she had wandered around the bathroom, become curious about the toilet that had no cover, somehow climbed up the slippery side of the bowl, and fell into the water. Nosey had been jungle born, and at this altitude in Mexico the nights are cold. Wet, frightened and cold, the animal shook uncontrollably. We were afraid the experience would end in pneumonia if we did not warm her at once. There was no heat in the room, and no hot water. We sent to the kitchen for *agua muy caliente*, filled the hot water bottle, dried the miserable little coatimundi, and tried to get her to lie next to the hot water bottle in the basket—which she refused to do. Finally we went to bed, put the little animal on my husband's chest, piled on the covers, and, exhausted from our day's trip and the excitement, we were all soon asleep. The next morning, Nosey was completely her happy, mischievous self, with not even a cold to show for the bitter experience.

In Mexico City, we began to make plans to get Nosey over the border. By now, we were so attached to her that leaving her in Mexico was unthinkable. My

Drinking water from a pitcher poses less of a problem to the coatimundi than it might for some mammals.



husband had a permit for collecting small mammals in Mexico—*dead mammals*. This one was very much alive, and we feared the customs officials might feel that our permit would not cover the situation. We took her to a veterinarian for examination and a health certificate, had her vaccinated for rabies, and made arrangements to ship her back to a friend in Mexico City should the officials refuse to clear her. Nosey was fast alseep when we drove into the customs shed for our examination. The officials were thorough, checked our specimens, noted our purchases, and passed us. In our innocence, we thought our worries were over, but little did we know the propensity for trouble of our mischievous pet.

At home, we decided to finish summer vacation at our cabin at Huntington Lake, in the Sierra. Here, at an altitude of 7000 feet, Nosey, our little jungle friend, adapted wonderfully. She climbed up the curtains to the window frames, jumped on the exposed beams, and raced along them, scattering dust into everything. Outside, she was equally at home in the yard, and she lost no time in showing it. She dug under the rocks for insects, chased the chipmunks, and frightened the birds; and one day she nearly scared herself—and us—to death.

Nosey had been climbing the small firs in the yard; but on this occasion, before we could stop her, she ran up the big 180-foot red fir that stood near the parking lot. Once at the top, she was afraid to come down. Neither brief jungle experience nor instinct had prepared the animal for a tree like this. There are big trees in the jungle, too, but these are laced together with hanging vines, and limbs close enough together so that an animal can dropeasily from branch to branch. This fir stood alone, with its long, well-spaced branches too far apart to provide footing for our small jungle animal. Nosey was in a real jam. She looked down in fright, and began to cry; but we were powerless to assist her. She had gotten herself into this predicament, and would have to get herself out. For long she whimpered, cowering on a branch close to the trunk of the tree. At last, she began to slide, with claws spread and belly flat to the trunk, from one limb to the next. At the point where each limb grew from the trunk, she stopped her fall, and ran out the length of the limb looking for an easier descent, but was forced to return to the trunk and continue the vertical slide toward the earth. The trip down the tree took nearly an hour, and when at last she reached the ground, she dashed for the basket and fell into an exhausted sleep.

Our little jungle friend looks something like its relative, the raccoon, but has red-gold pelage and a long, pointed nose.

It would be pleasant to report that Nosey had learned her lesson from this experience; but such was not the case. We had to grab her more than once—getting nipped sharply for our trouble—just as she started again for a trip up the same tree; and finally, for her own protection, we had to build a wire cage in the yard. Nosey has been our pet now for more than two years, and we have succeeded in teaching her practically nothing. She is a bundle of wonderful nervous energy, native instincts, and quick responses, but she cannot learn her name, nor will she come at our call.

Nosey gives a demonstration of how she acquired her first name. In its native habitat, the coatimundi is known as a "pisote."

At liberty in the garden, Nosey pushes with her pointed nose into the soft lawn, in search of insects that she scratches out with the long toenails of her front feet, cracks open the shells of snails and sucks out the soft flesh beneath, and eats with relish the long, fat earthworms that hide under the leaves on the ground beneath the rose bushes. Nosey often sleeps in the daytime, and if she wants a change in diet from her usual insects and worms, eats berries from the white mistletoe. These foods supplement the regular diet we provide. Nosey is a good eater, with an egg for breakfast and frozen raw hamburger at bed time. Her coat is now reddish-brown rather than the golden-red of her babyhood, and she has reached her full growth—about the size of a house cat. Her fur is coarse and shiny, and her dark eyes are bright.

In their natural habitat, coatimundis are gregarious animals. They hunt through the forest in packs of from ten to twenty.

Like her wild fellows, Nosey loves company. Never having known other coatis, she looks to us for companionship. When she was young, she cried if left alone for long periods. Now she has outgrown all that, but jumps excitedly about her cage when we visit her,

Strong, lithe, and with needle-sharp teeth, Nosey sometimes behaves like a spoiled child, scratching and biting with abandon. She views all strangers with a wary eye—especially visiting youngsters.

getting as close as possible to the wire so that we can rub her tummy and scratch her head.

When visitors come, we often demonstrate Nosey's wonderful powers of balance and dexterity by placing her on the clothesline wire. With no effort at all, she runs along the wire, balancing by flopping her tail from side to side. Or she may decide to go the length of the wires by hanging beneath them, moving across by the hand over hand, foot after foot method.

In the jungle, coatis catch and eat the large black tarantulas that often may be seen running over the floor of a clearing. If a tarantula is frightened from under a rock, it will scurry quickly away in search of another hiding place. In Panama, I have watched a coatimundi hustle after a tarantula, grab it in its front feet, turn it over and over, then start rubbing it back and forth as a woman would rub clothes on a washboard, until all the legs fall off and it is more palatable to eat.

Nosey had never seen a tarantula, so it was with a great deal of interest that we turned one out on the ground in front of her one day. She did not act surprised, nor did she stop an instant. She simply pounced on the running arachnid, began the rolling process, and before we knew it had eaten the prey and was looking around for another morsel. She did not have to learn how to handle tarantulas; Nature had furnished the instinct, and although she had never seen one before, she was instantly ready to deal with it.

More than two years have passed since we took Nosey Pisote from her home in the dry Yucatan jungles. She is still an interesting, although untamed pet, healthy and strong, with a shiny coat and bright eyes. Each afternoon, she is free to run in the yard, dig for food in the grass, or scamper up the cottonwood tree. But today, as I watch her at play, I am sorry that I tampered with Nature. Although her belly is full, her health sound, and her life free from predators, she has lost far more than she has gained in her captive life—companionship with her own kind, a chance to reproduce, the need for an environment where all the senses must be tuned to lurking dangers that make the mammals of the jungle alert and free.

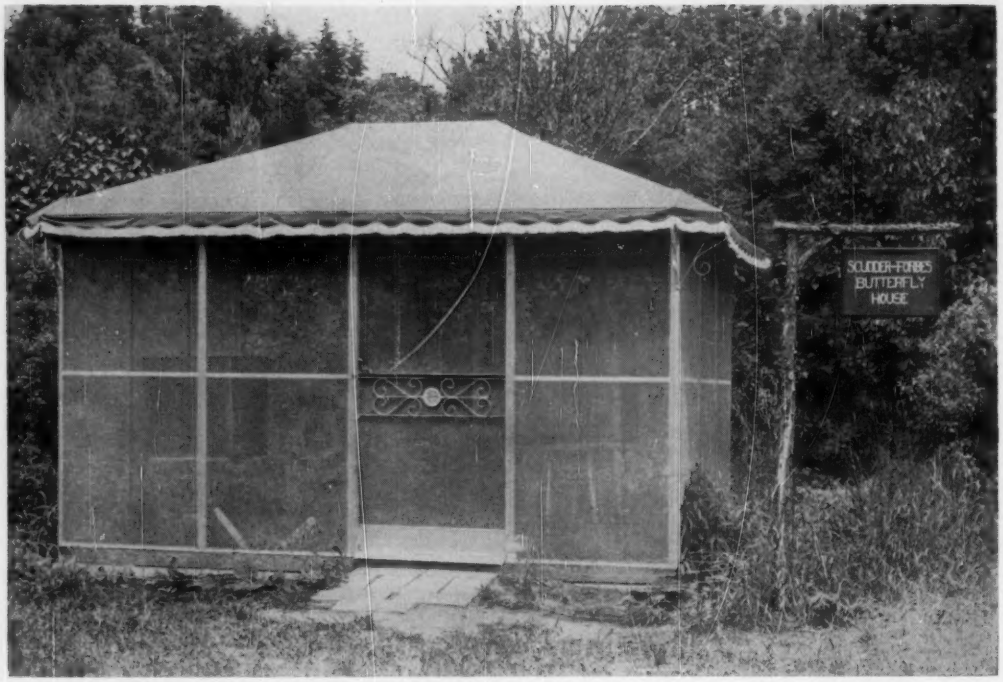
## TRAFFIC

*The cotton clouds moved slowly through the sky*
*Emptied of storm and, bright with final rays*
*Of falling sun, turned golden to the gaze,*
*Turned bronze and red and mauve with twilight dye,*
*When, somewhere deep—far deeper than the eye—*
*A spark of blinding knowledge burst ablaze,*
*Stripped me of time and earth's most cherished ways,*
*Stripped me of problems, plans—of sense and sigh.*

*A fleck of dust with destiny to keep—*
*A world whose dazzling sun is dwarfed and mean—*
*A grain of sand that floats the tumbling deep*
*Of galaxies uncounted, still unseen—*

*Then, back to earth, I marveled, being man,*
*At traffic roaring down the freeway span.*

John Gallinari Whidding




The Scudder-Forbes Butterfly House at the Drumlin Farm Wildlife Sanctuary in South Lincoln, Massachusetts, is a practical and inexpensive structure for the close study of some of the lesser-known lepidopteran habits and processes.

*In New England, there is a*

# Boarding House for Butterflies

By PHILIP BRADY

*Photographs by the Author*

North America's first "house" designed solely for the study and observation of butterflies is a simple structure of aluminum screening, nine by twelve feet in size, with a sod floor and green canvas roof. The aluminum screening insures that adult butterflies will not be poisoned, in rainy weather, by drinking moisture that forms on painted surfaces, as might happen if materials requiring paint were used. The sod floor, in addition to providing a more natural habitat, permits the growth of plants indoors.

This unusual biological research unit is located at the Drumlin Farm Wildlife Sanctuary in South Lincoln, Massachusetts, and is operated by the Massachusetts Audubon Society. The Sanctuary is a near-perfect site for the house because on its 175 acres are a wide variety of plants and shrubs. They provide a ready attraction for most of the 113 butterfly species found in Massachusetts.

The butterfly house, and its companion laboratory building, are adjacent to the large vegetable garden maintained at Drumlin Farm. The nearness of cabbages, carrots and other plants that attract butterflies and supply food is an obvious asset. Since the house was erected, it has been discovered that the canvas roof tends to block some of the sun needed for the comfort of sun-loving butterfly species, as well as the growth of plants, and the canvas will be replaced with screening when a new roof is needed.

The establishment of a butterfly house by the Massachusetts Audubon Society stemmed from the enthusiasm of Miss Ivy L. LeMon, a staff member, for the study of lepidoptera. For two years Miss LeMon had been assigned by the Society to cooperate with the Royal Ontario Museum in a program of banding monarch butterflies; and, as her knowledge of butterflies grew, so did her desire to learn more about them. Dr. Alexander B. Klots, author of *A Field Guide to Butterflies*, and assistant professor of biology at the City College of New York, had once told her: "There are so many missing links in the development of North American

butterflies that the subject could hardly be explored in a hundred years."

Miss LeMon pointed out: "In some otherwise well-known butterflies, we don't know what forms their larvae may take, nor exactly what their food requirements are. The larvae of the tawny crescent, for instance, is incompletely known; the hoary comma's life history is almost unknown and its food plant uncertain.

"Another interesting common trait we know little about is 'drumming.' When a black swallowtail, for instance, lands on a flower in a New England backyard, he stamps on the petals with his forefeet and whacks the blossoms with his antennae. For all the world, as one writer described it, 'Like a petulant child beating on his high chair for dinner.'

"Some authorities believe the butterflies listen to the vibrations from drumming to identify the plant. Others say the insect is tasting the plant. Most butterflies have taste pads on their forefeet, rather than in the mouth."

In order to undertake a close scrutiny of habits like these, the Audubon Society decided to build a simple butterfly house, patterned after the one that had been used so successfully by Dr. William Beebe, honorary curator of birds and head of tropical research for the New York Zoological Society. For the past several years, Dr. Beebe has been utilizing a large butterfly house at Simla, Trinidad, to study butterfly behavior, coloring and heredity. The structure had proved to be of great value.

The result of the Society's decision was the practical and inexpensive structure used so successfully last summer by Miss LeMon. In addition to the main butterfly research unit at Drumlin Farm, the Audubon Society also erected a much simpler structure at Wildwood Nature Camp, in Barre, Mass. This house was used by Miss LeMon to interest the campers in the study of butterflies, and to implement her own program.

Milkweed plants were transplanted both inside and outside "Flutter-By," Wildwood's butterfly house, and these attracted many monarchs for subsequent banding. The plants also supplied food for the butterflies inside the house. Eggs found on any milkweed plants were brought into the house, where campers cared for them, saw the eggs through their metamorphosis, banded and released the adult monarchs.

"In one two-week period at camp, over 200 monarch butterflies were banded," Miss LeMon said, "and butterfly study turned out to be a popular part of our Nature work. The whole insect program has changed from one of killing and collecting to one of observing the living insect and its habits in the butterfly houses.

"We don't forbid youngsters to collect butterflies," she said, "but we find it quite easy to channel their thinking and energies into the monarch banding program, and into a study of the habits of the insects. Too, the houses have provided Audubon members and friends in New England with an opportunity to participate in our program by supplying us with larvae, and by visits to the houses to observe our activities."

The solicitation of specimens for study required the services of an expert, who could identify the offerings as they were received. Such advice and assistance was supplied by Dr. W. T. M. Forbes of Cambridge, a noted authority on the immature stages of butterflies. Formerly of the entomology department of Cornell, Dr. Forbes presently is assisting the Museum of Comparative Zoology, at Harvard University, to classify its butterfly collection. Miss LeMon is free to call upon Dr. Forbes for assistance at any time.

The house at Lincoln, it should be noted, is named the Scudder-Forbes Butterfly House, in honor of both Dr. Forbes and Dr. William H. Scudder, the able Massachusetts naturalist whose post-Civil War works on the butterflies of Essex County are still a scientific landmark.

Butterfly study has become an important part of the Nature work at Drumlin Farm, and has changed from a program of killing and collecting to one of observing the living insects and their habits, in the butterfly house built especially for them.

Since Miss LeMon's investigations involve the various stages of butterfly development from egg to flying insect, she has equipped her house with a number of unpainted screened cases and glass jars of various sizes, all designed to hold specimens. A variety of potted food plants for free flying adults also are on hand. During the past summer, Miss LeMon had in all stages of development the white cabbage, black swallowtail and monarch butterflies, all common New England species, and through the summer she also had on display polyphemus, cecropia and luna moths.

The butterfly house, at times, might seem to the visitor like a market gardener's stall. There are

The Butterfly House is equipped with a number of unpainted screened cases, glass jars of different sizes, and a selection of the proper plants for the caterpillars of various species.

usually potted carrots, to provide food for the black swallowtail caterpillars that feed on their leaves; cabbages for the white cabbage butterfly that spends its life cycle in association with this vegetable and its relatives; and milkweed for the larvae of the monarch. Selection of the proper plants, says Miss LeMon, is one of the tricks of butterfly culture. Many butterflies—but not all—are particular, and they lay their eggs only on certain species of plants. When the eggs hatch, the caterpillars feed on these plants, and the life cycle of the insect therefore is woven around the plant.

As part of her research, Miss LeMon is developing lists of plants that are of value to her program. One of these lists shows the food plants that the caterpillar feeds on, while the other itemizes plants producing nectar attractive to adults. Some plants, of course, are used both as larval and adult food. Those supplying food for larvae include alfalfa, apple, ash, aster, blue flag, butternut, cherry, clover and dogbane. Adult food plants include milkweed, butterfly bush, lespedeza, hollyhock, primrose and sunflower.

To implement her knowledge of butterfly research and collection techniques, and to learn more about how the butterfly house should be used, Miss LeMon recently spent five weeks at Bartica, British Guiana, and at Simla, Trinidad.

On this trip, Miss LeMon traveled with the only professional woman butterfly collector in British Guiana—Miss Eva Salsa. Her guide's wide knowledge of the people and geography of the country enabled Miss Salsa to take Miss LeMon farther into the interior of this country than many expeditions would normally travel. Along the main rivers, they went by steamer and tugs, and into the deeper jungle by native canoe. Three of the most important streams visited in British Guiana were the Essequibo, Mazaruni and Cuyuni rivers.

The neotropical belt that runs through the rain forest of South America is, Miss LeMon remarked, "The richest belt for butterflies in the world." In addition to collecting for several universities and museums, she took colored movies of collection methods, as well as of the insects, flora and fauna of the region. At Simla, Miss LeMon visited Dr. Beebe, who provided her with a suggested work schedule that eventually will lead to parallel experiments between the tropical and North American research units. In this way they will be able to determine variations between the reactions of tropical and temperate zone butterflies.

Among research techniques visitors may see at the Drumlin Farm butterfly house is a miniature "alarm clock," used to alert researchers when a butterfly pupa begins tossing restlessly within its chrysalis. That is the time when the worm inside the lacquered, cigar-shaped chrysalis really begins to turn into a butterfly. To know exactly when this not-too-well understood process starts, Miss LeMon places the chrysalis in contact with two small copper wires. When the pupa wiggles inside its "shell," the wires are shorted, complete the circuit, and an ordinary doorbell begins clanging.

Color photography also is being employed to record movements that are almost too swift for the human eye to see. The actual emergence of the adult from the chrysalid stage can be caught on film, and comparisons made between several such films to note variations and significant movements.

As a matter of interest, the last three late-staying monarchs at Drumlin Farm last year were banded and released on October 23, just in time to delight and enlighten the members of a visiting woman's garden club. These three butterflies, all citizens of the State of Maine, had arrived earlier with six others, as a contribution. When the package in which they were shipped was opened, Miss LeMon found that the larvae had hatched, and had eaten their eggshells to satisfy ravenous appetites. Fresh and tender milkweed plants were hastily gathered, and the monarch-mites fed. Now long since departed on their southern journey, it is conceivable that one of them might be that super-monarch that will make the complete migration so eagerly awaited by lepidopterists.

The results of last summer's activities were interesting and stimulating, Miss LeMon says; but much more work will have to be done before significant contributions to the present patchwork knowledge of some New England butterfly species can be announced. One important result of this work, she feels, is the great interest aroused in both young students at the Audubon Nature camps, and in many adults. Now such interested people also can participate in a worthwhile conservation and study program, supplementing the bird watching and feeding schedule of the Society.

Both Miss LeMon and the Society have been greatly pleased and encouraged by the response, last summer, to their appeal for butterfly larvae. The many specimens received contributed materially to the first season's successful operation.

# Puzzle of the Yellow Dye Tree

By HELEN M. KOVAR

*Photographs by Anton J. Kovar*

The fine, white clusters of the yellowwood bloom remind one of the blossom of the locust, and the tree is in demand as an ornamental.

Just a little more than 150 years ago, Francois A. Michaux was making his long journey "to the westward of the Allegany Mountains" in search of botanical data for his *North American Sylva*. His journal contains a lively description of pioneer conditions in America in the early nineteenth century, and interspersed here and there are interesting comments on some of the plants he studied. After a long and arduous trip, through Pennsylvania and down the Ohio, he finally reached Tennessee.

Near Nashville, Michaux mentions a tree found "more particularly in these forests, which, in the form of its fruit, and the position of its leaves, appears to have a great resemblance to the *Sophora japonica*, with the wood of which the Chinese dye their silk yellow. My father, who discovered this tree in 1796, thought it might be employed for the same use, and become an important article of commerce to the country." But nowhere in his journal does he give the botanical name for this interesting tree! Who could resist doing a little detective work on this?

The only other clues were in the sentences that followed in Michaux's journal: "Several persons being anxious to know if it were possible to fix the beautiful yellow colour which its wood communicates to water by simple, cold infusion, I took the opportunity of my residence at Nashville to send 20 pounds weight of it to New York, one-half of which was to be delivered to Dr. Mitchill, professor of chemistry, and the other to be forwarded to Paris. This tree seldom grows higher than 40 feet, and thrives best on the Knobs, a species of little hills, the soil of which is very rich. Some of the inhabitants have remarked that there is not any tree in the country which yields such an abundance of sap in the spring. . ."

As we know, when André Michaux saw this tree for the first time, he thought it a species of the *Sophora*, a well-known Asiatic genus. Much later, in the *North American Sylva*, his son placed it into a new genus *Virgilia*, and named the species *Lutea*. Not knowing the work of the Michaux, Rafinesque, in 1824, gave it the new name of *Cladrastis fragrans*, but omitted any description, which of course rendered the name invalid. Therefore, in 1825, Rafinesque gave it the name *Cladrastis tinctoria*.

The low-branching habit of *Cladrastis*, and its confined natural range, minimize its importance as a source of lumber. The illustrated specimen is growing on the campus of Pennsylvania State University.

Finally, Koch, in his *Dendrologia*, combined Rafinesque's generic name *Cladrastis* with the original specific name given by Francois Michaux, and thus the species is known now as *Cladrastis lutea (Michx f) Koch.*

And so, after untangling this good example of a nineteenth century botanical nomenclature problem, we find that the tree is none other than the yellowwood or yellow ash, yellow locust, *Virgilia* or gopherwood. The wood—especially the roots—was indeed used by the Tennessee pioneer women in dyeing their homespun. However, they seem to have boiled the chopped-up roots, rather than simply infusing in cold water, as Michaux had suggested.

Another important use of the yellowwood was in making gun stocks. It takes only a little imagination to picture a mountain man in buckskins, sitting patiently by the hour whittling a piece of this light wood for his most precious possession, his rifle. This alone renders the yellowwood a place of honor in our history. The yellowwood has a beautiful, if rather infrequent, bloom—white clusters, varying in fragrance, that remind one of the more common locust bloom. There is a good demand for the tree as an ornamental, and many nurseries stock it under the name Virgilia.

The wood of this tree truly is a beautiful yellow, but it turns somewhat brown, on contact with the air. It takes a finish like satin, is close-grained, and has easily distinguishable yearly growth rings. Because the yellowwood is likely to branch about seven feet above the ground, it is not much used for lumber. Another reason for its unimportance to the lumber industry is the small area in which it grows, only in certain parts of Tennessee, Kentucky, Alabama, Georgia, Arkansas and Missouri. It is interesting to note that this is the only species of *Cladrastis* in America; the other three species are Asiatic.

# Jack and His Brother

By W. BRYANT TYRRELL

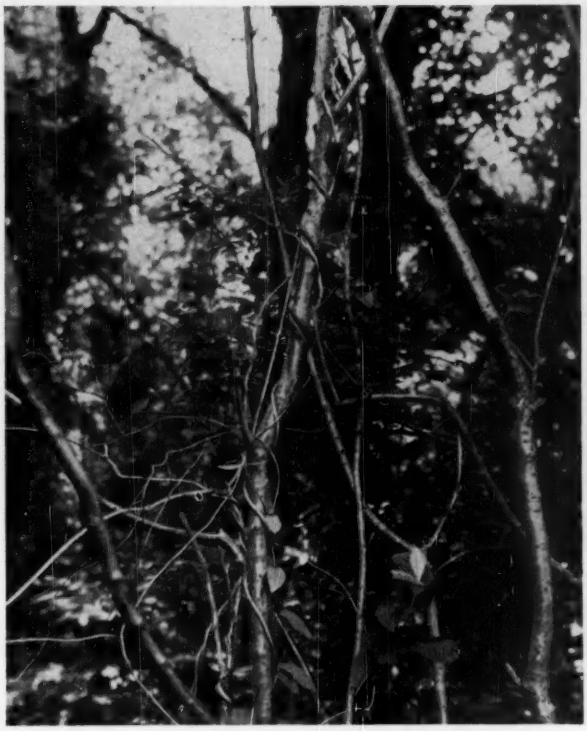
*Photograph by the Author*

In Garrett County, Maryland, the author found a freak Jack-in-the-pulpit flower that had a smaller one growing from its base. The second flower was not perfect, and its spathe was not closed in front, as it is in the ordinary Jack.

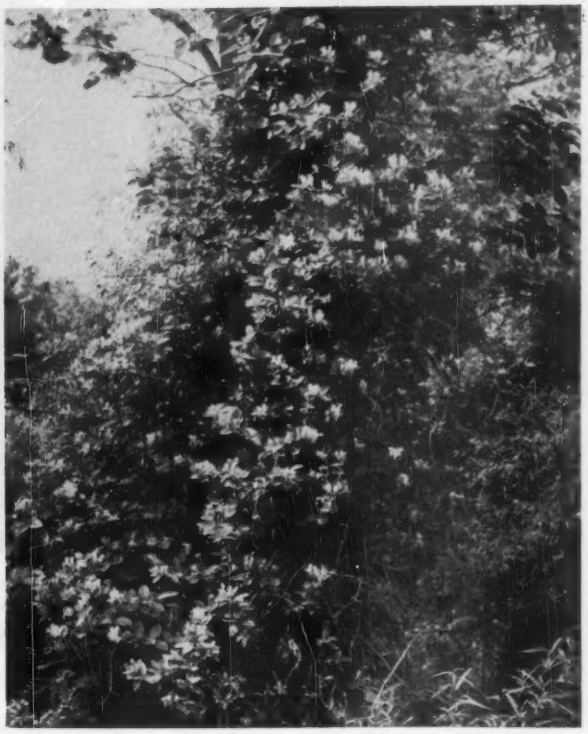
EVERYONE WHO roams the woods of the eastern half of the country feels on familiar terms with the Jack-in-the pulpit and its several color phases. They know, also, that the Jack is sometimes called the Indian turnip, because the turnip-shaped underground corn was once cooked and eaten by the American Indian. But it is not likely that many people have seen a freak double Jack. The specimen I saw recently is the only one I have encountered in more than forty-five years of wandering the woods and fields of the country.

I was spending a week at the Allegany County Bird Club Junior Nature and Conservation Camp, at Pleasant Valley in Garrett County, Maryland, where one of the boys showed me the freak Jack in a clump of brush behind his cabin.

A perfect fertile flower was growing out of the stem, or petiole, of one of the leaves, and not at the junction of the two leaves, as is usual. From the base of this flower arose another, but imperfect, flower. The imperfect flower had a rudimentary spadix (which, of course, is the Jack), and the spathe, that surrounds and covers Jack, was not closed in front. It was a most unusual flower, and although it was in a difficult place for photography, I managed to get a picture of it with the assistance of a flash-bulb.



The vine of the Japanese honeysuckle, in its upward climb, often constricts the trunks of young trees to such an extent that large spiral grooves are formed.



Scenes like this are now familiar along the Eastern seaboard and west to Indiana. Trees in low, moist woods often are draped with Japanese honeysuckle.

# The Japanese Honeysuckle

By FRANKLIN C. DAIBER

*Photographs by the Author*

THE Japanese honeysuckle, now so prevalent in the lowland woods from Connecticut west to Indiana and south to Florida, was introduced into the United States from eastern Asia in 1806. It can be recognized as a twining shrub, with opposite ovate to oblong-ovate leaves that remain green long after killing frosts. The leaves are pubescent on both sides when young, becoming shiny on the upper surface with age.

Botanically, the Japanese honeysuckle is *Lonicera japonica* Thunberg, and belongs to the honeysuckle family Caprifoliaceae, of some 400 species. There are about 180 species belonging to the genus *Lonicera*, named after Adam Lonicer or Lonitzer, a German physician and botanist who lived from 1528 to 1586. The most frequently seen variety has pure white flowers, at first, changing to yellow. The upper lip is divided nearly to the middle into oblong lobes. The style and stamens are longer than the limb of the corolla, and the fruit is black, persisting well into the winter.

When it was introduced, the plant was valued for its fragrance and its suitability as a ground cover, but it is difficult to eradicate once established, and becomes a pest where it is allowed to get out of control. It spreads primarily by root shoots, and grows best in relatively open, moist areas; on roadside embankments, and in fence rows and clearings.

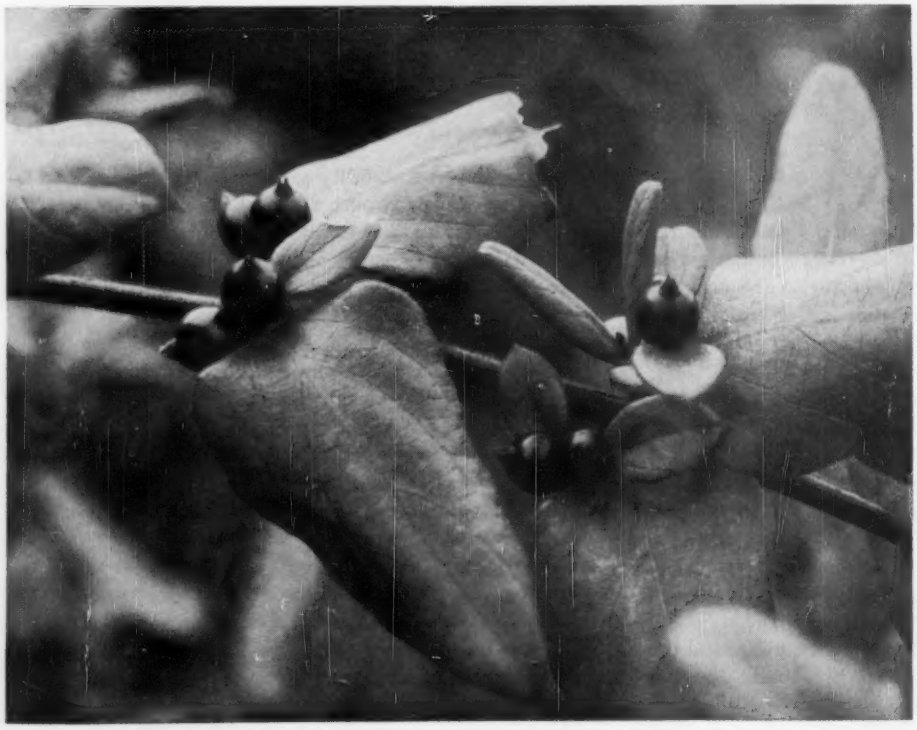
Marked changes occur in a plant community when the Japanese honeysuckle becomes established. In twining about and climbing small tree trunks, the plant often smothers its hosts under its weight and shade. It covers the ground with such a dense growth that it excludes the native herbs and shrubs. For these reasons, tree reproduction is poor where the Japanese honeysuckle is abundant.

In favor of this plant, however, are the facts that it provides good cover, and a certain amount of food, for wildlife. Quail, bluebirds, turkeys, goldfinches, juncos, robins, white-throated sparrows and hermit thrushes have been reported as feeding on the fruit, while the white-tailed deer has been noted eating the leaves,

Flowers of the Japanese honeysuckle are pure white when they first open, and change with age to a dull gold-yellow. The upper lip is divided nearly to the middle of the oblong lobes, and the style and stamens are longer than the limb of the corolla.

although in small amounts. The characteristic propagation by root shoots makes the Japanese honeysuckle a good retarder of soil erosion on the embankments of road cuts—a factor of some importance in these days of increased highway construction. During June and July, the fragrance of the blossom is familiar to people who travel the byways, so, in spite of some of its habits, the Japanese honeysuckle cannot be charged off as a complete pest. It is an example of an exotic plant that might better have remained in its native habitat.

The clusters of black fruit of the Japanese honeysuckle supplement the winter diet of a number of species of birds, while the white-tailed deer has been observed to browse on the leaves and branches.



Massachusetts State Route 128, a limited access, divided highway that circumferentially skirts the congested area of Boston. A variable median strip with trees saved, good shoulders and well-protected slopes. This safe and attractive highway is on the Interstate Highway System.

Or would you prefer conditions that would permit the new and expensive Interstate Highway System to be depreciated by such conditions as this found on U. S. 36 west of Jacksonville, Illinois. Unless protection is immediately provided the public's investment in the System will suffer seriously.

# These Are *Your* Highways!

THIRTY-FIVE billion dollars add up to a lot of money! This is the minimum amount the American people are going to pay for 41,000 miles of limited access, modern express-ways in the Interstate Highway System, during the next dozen years. This is a vast investment.

Highway engineers are designing these highways for the greatest efficiency and safety. Seventy-five percent of the mileage will be through new locations. No business will have direct access to the highways, thus eliminating the danger of roadside slums that have impaired so many thousands of miles of existing highways.

The outdoor advertising industry, however, is seeking special privilege. It insists upon a right to be seen from the highway; to intrude; to capitalize on a captive audience; to distract the attention of the motorist from the serious business of driving at high speeds. To this end the industry is opposing a Federal policy that would encourage the States to provide protection of the enormous public investment in these highways. It is equally opposing any regulation at a State level.

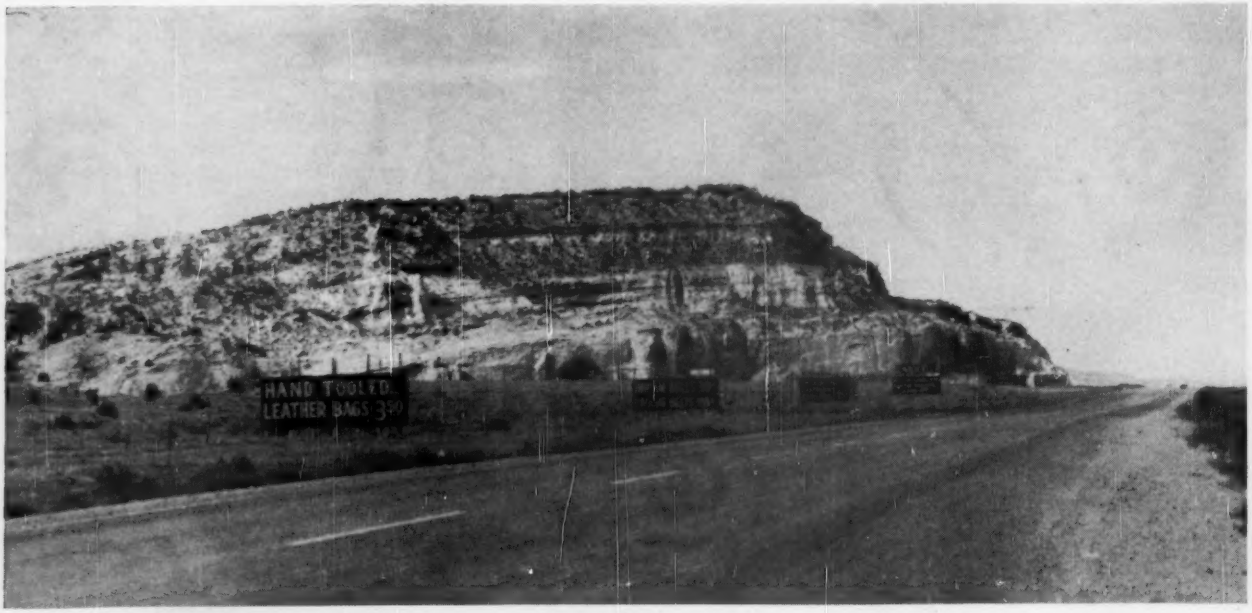
Congress has before it bills that would spell out Federal policy and aid the States in applying it. It is up to the people to see to it that their money is not wasted. This is the democratic way. These are *your highways*.

This was the first Roadside Rest to be established in the State of Pennsylvania, at Concordville. The huge billboard, maintained by the General Outdoor Advertising Company, one of the members of the Outdoor Advertising Association of America, which claims to consider the public interest, provided an obviously discordant note at this rest spot. It took eight years of effort before the outdoor advertising company finally agreed to remove the sign.

A section of U. S. 40 west of Baltimore, a safe modern highway free of signs and billboards from Pine Orchard to Ridgeville, Maryland. In the inset are the varied signs that are increasing rapidly along this highway from Ridgeville to Frederick, destroying beauty and safety.

An advertiser catering to the tourist trade thus "improves" the scenery on Route 66 in Arizona. All the way from Albuquerque, New Mexico, to Flagstaff, Arizona, this highway suffers from sign infestation, which is as unsafe as it is unsightly.

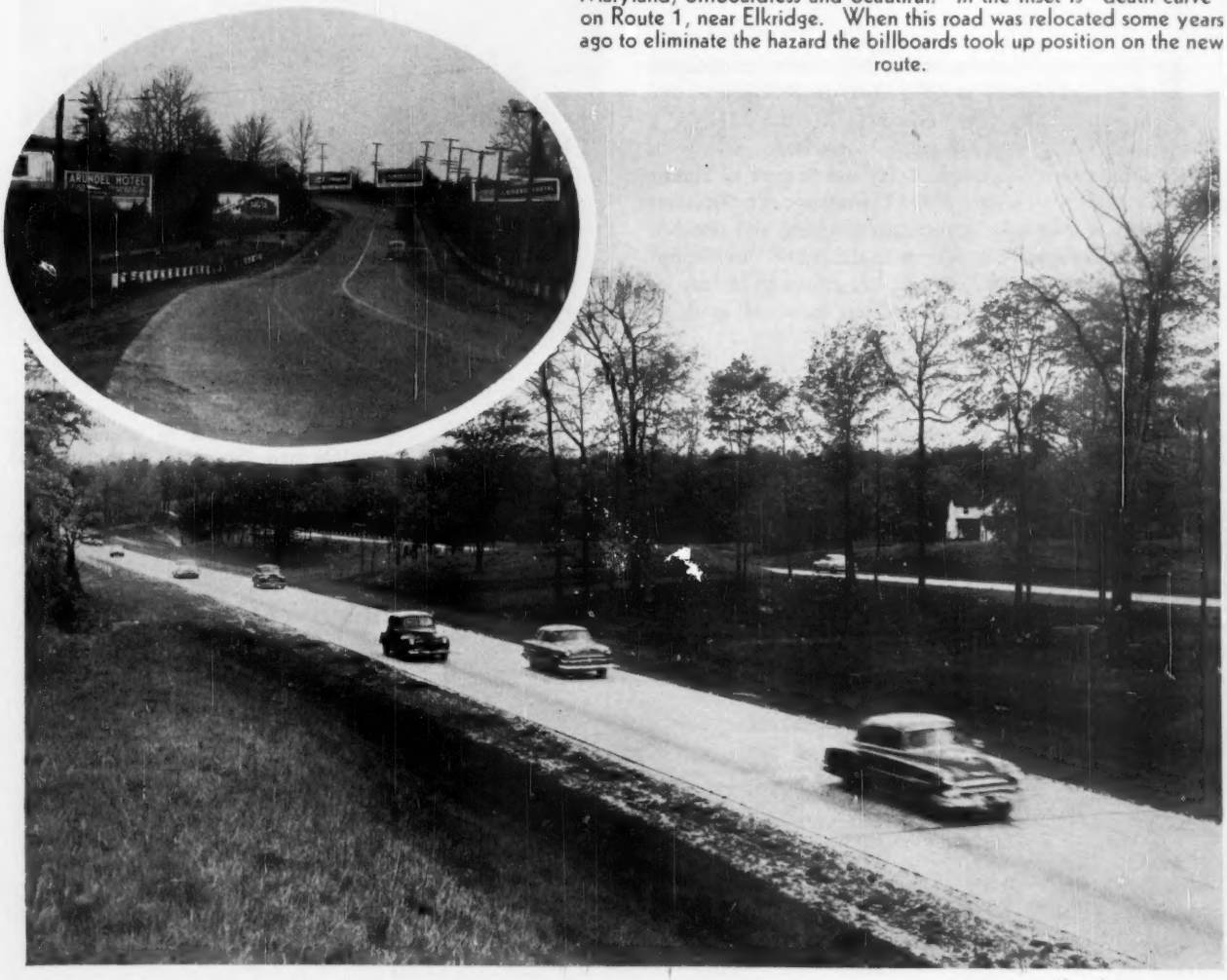
COURTESY CONSERVATION EDUCATION ASSOCIATION



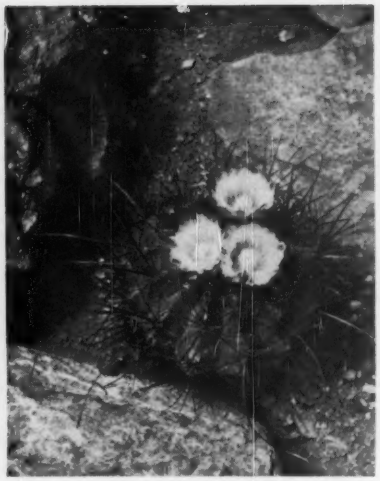
COURTESY CONSERVATION EDUCATION ASSOCIATION

What roadside signs do to a spectacular view of the San Francisco peaks near Flagstaff, Arizona, approaching that community from the east on Route 66, one of the most badly ruined highways in the West, signwise.

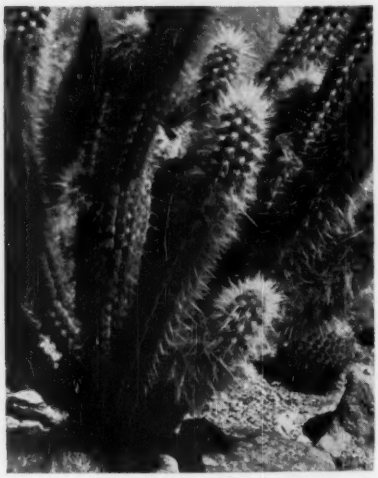
A section of the Baltimore-Washington Expressway near Jessups, Maryland, billboardless and beautiful. In the inset is "death curve" on Route 1, near Elkridge. When this road was relocated some years ago to eliminate the hazard the billboards took up position on the new route.



*Cleistocactus straussii,* of Bolivia and Argentina, has purple-red flowers and vari-colored stems.



The soft color of *Hamatocactus hamatacanthus* flowers contrasts sharply with needle-like spines.



The columnar cactus *Oreocereus fossulatus,* native of Peru and Bolivia, grows to four feet tall.

# Cactuses of Strawberry Canyon

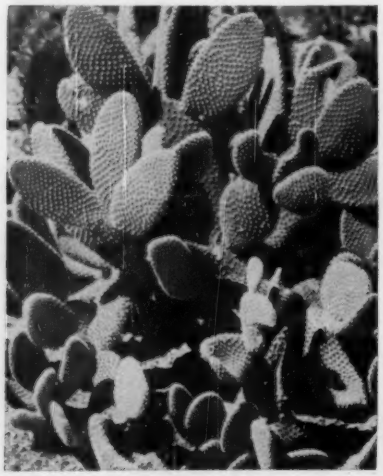
By NORMAN PIETAN

*Photographs by the Author*

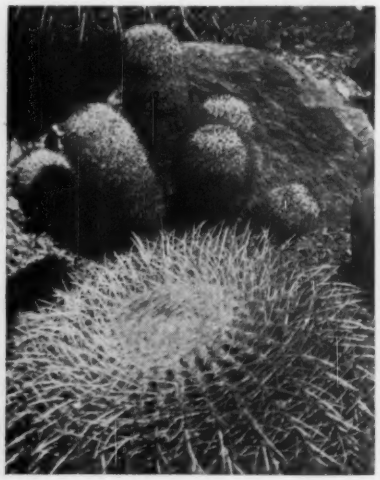
In Strawberry Canyon, in the hills above the campus of the University of California, in Berkeley, is the twenty-acre University Botanical Garden. It is a pleasant valley, looking much like a large park, with its thousands of different plants and flowers of almost every color. As a part of the University, the Botanical Garden is primarily devoted to teaching and research work, although it also is open to the public. In twenty-five years, this interesting area has grown to include its present-day collection of some ten thousand kinds of plants, and, since its inception, has been under the direction of Dr. T. Harper Goodspeed, professor of botany at the University.

Much of the Botanical Garden is organized into units, according to plant type and habitat, and among these is a section devoted to the cactuses—a section attractive not only to students and others interested in the botany of the plants, but also to photographers, who are lured by the unusual shapes, colors and textures that challenge their photographic skill.

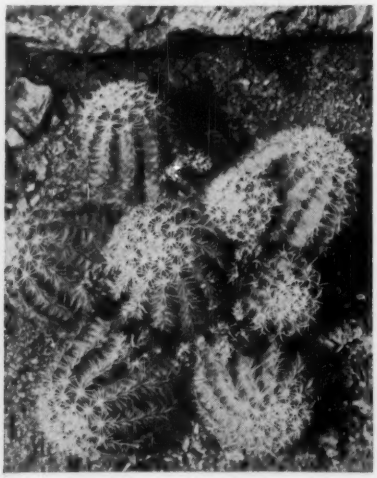
A white-spined form of *Opuntia microdasys* is often called the "bunny ear cactus."

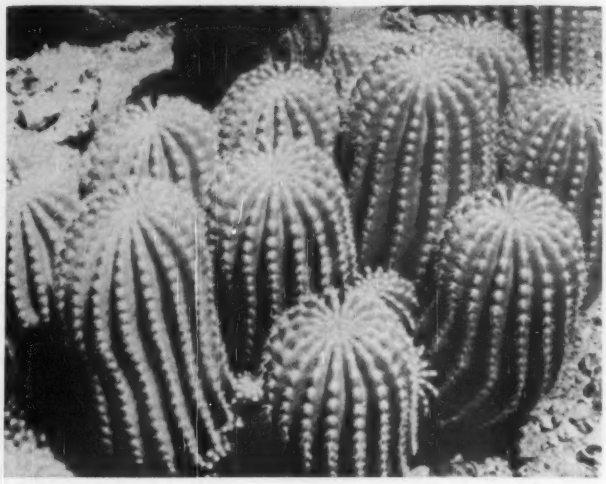


Growing together are *Echinocactus grusonii,* in foreground, and *Mammillaria microhelia.*



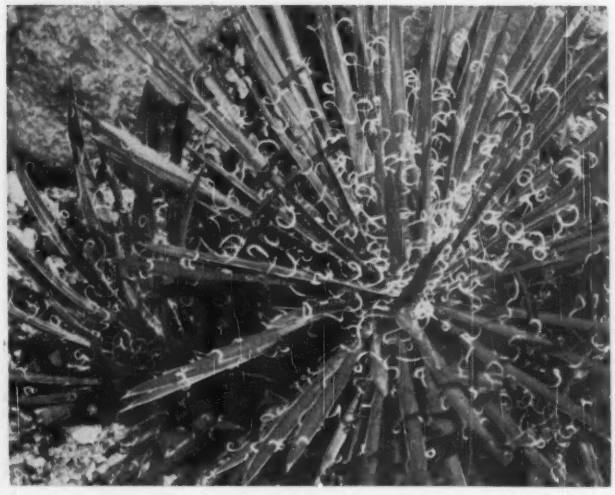
A regular pattern of spines along ridges mark this cactus of the species *Echinocereus.*



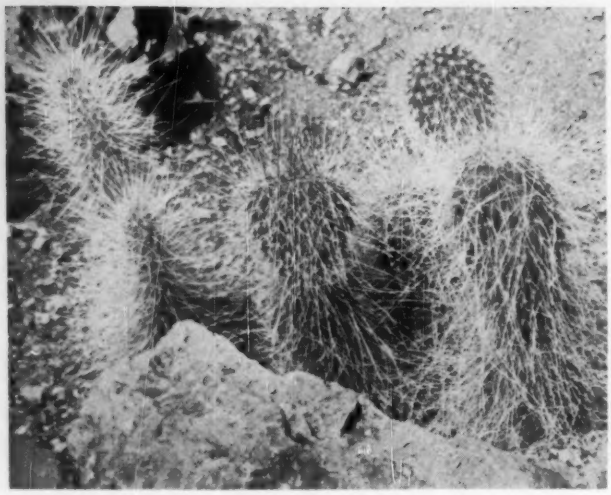


A native of Argentina, *Trichocereus schickendantzii* is a fairly hardy cactus that should be grown in full sun. It produces flowers that range from white to rose, and are up to six inches in diameter. The plant is tolerant of nearly any soil condition.

This is one of the coarse century plants, *Agave asperrima*, but it is superior to the common century plant for garden use by virtue of its more rigid and stylized form. A native of Mexico and Texas, it has a deep color and strong, smooth leaves.

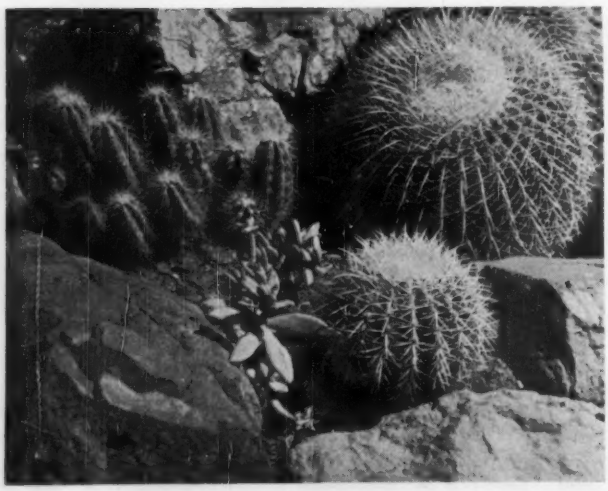


The *Agave geminiflora*, from Mexico, is easily propagated from the many basal stolons produced on the plant. The light, spidery hairs are actually fragments of the epidermis of the plant that curl back from the leaf margins. It is a dwarf species, and is fairly hardy.



A native of the southwestern United States is *Opuntia erinacea*. In the wild, the plants are quite variable as to spine length and color, and also as to the color of the flower. This is a particularly long-spined form from southern California, often referred to as the "grizzly bear cactus."

The Texas native *Echinocereus stramineus*, in background, is most suitable for culture in areas with a desert climate. *Pachyphytum werdermannii*, in the foreground, has purplish-white leaves and deep brick-red flowers. Outdoors, it prefers a sheltered place in semi-shade.



The golden barrel cactus of Mexico, *Echinocactus grusonii*, at right, is the most satisfactory of all barrel cactuses for garden use. In the foreground may be seen *Pachyphytum werdermanni* from Mexico, and at the left is *Echinocereus stramineus*, shown in more detail above.

# A Poisonous Subject

## An Editorial

When, at the conclusion of World War II, the insecticide DDT was about to be released for general public use, we warned that this was dangerous business. We declared that too little was known about its toxic effects on various forms of wildlife, or even its effects on human life under uncontrolled conditions. Some economic entomologists shared our view, as did a few wildlife biologists. By and large, however, the reaction seemed to be that we were unduly alarmed.

Developments during the past dozen years have proved that we were right. Chemists have produced more and more powerful insecticides, herbicides, fungicides and rodenticides. These have been released for public use; for spraying and dusting and spreading about, too often with precious little concern for long-range or side effects. Presumably safe dosages have been suggested, but it is human to conclude that if a recommended dosage is guaranteed to be effective, a stronger dose should do an even better job.

Thus the distribution of agricultural chemicals has grown spectacularly, while research and knowledge about them have lagged far behind. Correlatively, medical recognition of the introduction of these poisons —for that is, of course, what they are—into the human system has been slow. Yet there has been steady increase of evidence of ill effects on human beings through inhalation of sprays and dusts and through ingestion of fruits, vegetables, milk and other foods on which or in which these poisons persist. There is even a product on the market with which one is supposed to wash apples, pears, peaches and plums in order to make them safe to eat. Somehow this seems to us to be as risky as it is ridiculous.

So far as wildlife is concerned the effects of chemical poisons have been more specific, spectacular and wholesale. Fishes, frogs, toads and crustaceans have proved most susceptible. A body of evidence is building up with respect to their effects upon birds, even to the extent of causing sterility, or lowered egg production. Effects on mammals are little known although adverse results are increasingly suspected. There is little knowledge of the effect of these poisons on soil bacteria upon which soil fertility depends, but is not unreasonable to suspect that there is danger here, also.

Certainly the ecological effects of herbicides and insecticides on wildlife habitat cannot help but be dislocating. The implications of this are far reaching.

Wildlife specialists have been among the first to recognize this problem and have embarked on as much research as funds and personnel have permitted. This has not, in fact, been more than a drop in the bucket, yet Congress marks time on legislation that would implement a more widespread and a more intensive study of the problem.

Last year the Conservation Foundation and the New York Zoological Society assigned Dr. John L. George, Associate Curator of Mammals at the New York Zoological Park, to make a study of "The Pesticide Problem." This was a preliminary investigation of present knowledge upon which to base suggestions for action. His report constitutes an excellent summary, and presents recommendations that emphasize the importance of careful study of the toxic effects of these substances under a variety of field conditions. Dr. George's report is objective and restrained, but even with its restraint it indicates a most serious situation.

Public awareness of this problem has gradually increased as a result of reaction to such activities as the wholesale spraying for gypsy moth in the New York and New England areas. Aroused naturalists of such eminence as Dr. Robert Cushman Murphy arose in opposition.

In Maryland, close to the District of Columbia, an idea hatched in a college laboratory resulted in a squadron of sprayers descending upon residential areas, unannounced, to spray for gnats. The embattled citizenry stopped this before it got far by appeal to the police, but the incident was typical of some of the poor thinking and planning that often goes into such programs.

Most recently, publicity that indicated that there was to be widespread spraying with powerful dieldrin to fight the spread of the fire ant in several southern States, stirred wide opposition. According to the U. S. Department of Agriculture the reports were exaggerated, and only controlled treatment in collaboration with the States and wildlife officials was contemplated. Whether this policy was determined before or after the publicity we do not know.

Our control over drug poisons dispensed by the druggist is in sharp contrast to the control over the economic poisons, as they are officially termed. The legal requirements for registration and distribution of these products seem to us to be as full of holes as a Swiss cheese. Manufacture of economic poisons constitutes "big business," and, in our opinion, attempts at public protection fall far short of real need.

Pending legislation to further studies of the effects of these chemicals on wildlife should be passed. Other research on a national basis should be spurred. The manufacturers themselves should be required to provide more conclusive proof of significant research on their part. We cannot, we are convinced, continue to subject ourselves and our ecology to these hazards, which one author described in the title of his book as "Our Daily Poison."

# Thomas Jefferson, Statesman and Scientist

By EVA BEARD

NATIONAL PARK SERVICE PHOTOGRAPH

*Thomas Jefferson, from a painting by Charles Wilson Peale, in Independence Hall, Philadelphia.*

"And botany I rank with the most valuable sciences, whether we consider its subjects as furnishing the principal subsistence of life to man and beast, delicious varieties for our tables, refreshment from our orchards, the adornments of our flower-borders, shade and perfume of our groves, materials for our buildings or medicaments for our bodies . . .No country gentleman should be without what amuses every step he takes into his fields."

This is Thomas Jefferson, writing from Monticello in October, 1814, when sweet gum, oak and buckeye were aflame over the Blue Ridge Mountains to the west. It is the end of summer, and the end of a long and arduous life is only a little more than a decade away. The great statesman, withdrawn now to his beloved hilltop, is absorbed in his gardens, where grow flowers, shrubs and trees from many parts of the world. For more than twenty years, since his residence in Paris as Minister to France, seeds, plants, and cuttings have travelled from Europe to America, and even more from the half-explored frontier woodlands, meadows and prairies of America to eager botanists and gardeners abroad. He takes great pleasure in the fine botanical library, too, which along with a wealth of other books on a vast variety of subjects is to become the nucleus of our great Library of Congress.

He is absorbed, too, in his plans for the University of Virginia. Through openings in the treetops, he can see in his mind's eye the beautiful college buildings rising at Charlottesville around their green rectangle of lawn. Here all the sciences shall be at home, the new as well as the old. Botany, zoology, mineralogy, and chemistry shall hold up their heads with the older sciences of physics and astronomy, and with the classics. Agriculture, also, shall be taught; shall be rated as a science. And there must be an arboretum and a botanical garden—which, unfortunately, did not come to pass—home for all the plants of the world that will thrive in the Blue Ridge climate.

Jefferson came naturally by his special interest in botany—for botany, of all the emerging sciences of the day, called forth, perhaps, his greatest devotion. His mother, Jane Randolph, was the daughter of Isham Randolph, himself a botanist of note. Jefferson lived, moreover, in a region full of new and interesting plants, and in a day when the horizons of gardening were widening to receive all the riches of lands newly explored.

Since his days as a student at the College of William and Mary at Williamsburg, Jefferson had formed the habit of noting, in his diary and in his garden book at Monticello, exact descriptions of plants, animals, climate, weather, geography. Thus, when Marbois, the French Minister at Philadelphia, was asked by his government to obtain accurate information concerning each of the States of the Union, it was to Jefferson he turned for an account of Virginia. It was hard work to sort out the diary notes of years. Jefferson finally achieved a volume which he called *Notes on the State of Virginia*, and which he arranged to have printed in England in 1781. It was translated into French and German, and ran into many editions. Judged by its worldwide influence, it was the most important American scientific work up to that date. And because of its exact descriptions of mountains, rivers, plains, valleys, climate, it was the first great American contribution to geography, and one of his many gifts to science.

COURTESY THOMAS JEFFERSON MEMORIAL FOUNDATION

One of America's historic dwellings is Monticello, Thomas Jefferson's residence near Charlottesville in Albemarle County, Virginia. Here the third President spent the closing years of his life, absorbed in his gardens and his plans for the University of Virginia.

In its section on plants, the work followed the old horticultural plan. "I will sketch out those (plants)," writes the author, "which would principally attract notice as being 1. Medicinal 2. Esculent 3. Ornamental 4. Useful for Fabrication, adding the Linnaean to the popular names, as the latter might not convey precise information to a foreigner." He lists some twenty-one medicinal plants, including lobelia, senna, mallow, Jamestown weed, valerian, ginseng, pleurisy root and gentian.

Among food plants, in addition to wild fruits, berries, nuts and the staple crops of the Indians like "tobacco, maize, round potatoes, pumkins, Cymlings, squashes," he lists tuckahoe (the bulbous root of *Lycoperdon*); a root used by the Indians and early colonists, probably that of the golden-club or the arrow arum; Jerusalem artichokes; long potatoes (that we now call sweet potatoes); granadillas or maycocks, which were the maypop passionflower; and wild oats, or the modern wild rice.

The "Paccan or Illinois nut" interested Jefferson greatly. "Were I to venture to describe this, speaking of the fruit from memory, and of the leaf from plants of two years growth, I should specify it as the *Juglans alba*, with leaves lanceolate, acuminate, serrate, tomentose, fruit small, ovate, compressed, little sculptured, sweet, shell thin. It grows on the Illinois, Wabash, Ohio and Mississippi." This was the earliest published botanical description of the pecan. Jefferson provided hundreds of seeds for his friends abroad, and set out more hundreds of pecan trees at Monticello.

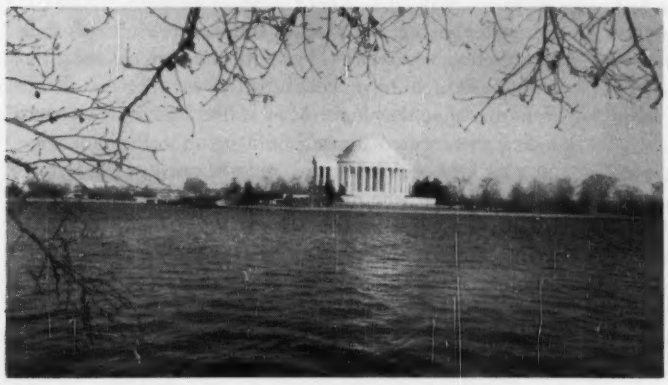
During Jefferson's five years abroad, from 1784 to 1789, packets of tree seeds, cuttings and plants of the olive, Italian cherries, plums, grape vines, apricots, almonds, and figs arrived at Monticello. Many of the plants did not survive, like the olive trees he sent to South Carolina, hoping to start olive culture in the southern States. But upland rice from Africa flourished in the hills of Georgia, and in the flower and vegetable gardens of the South grew many of the gifts from "my good old friend Thouin," chief gardener of the *Jardin des Plantes* in Paris. "Tomatas" or tomatoes were planted at Monticello in 1811.

In May of the year 1804, the great Lewis and Clark expedition, launched at last after more than ten years of effort on Jefferson's part, set off up the Missouri River. At Jefferson's request, the expedition, in the matter of what to notice in botany, zoology or Indian history, was under the direction of Dr. Benjamin Smith Barton, professor of natural history and botany at the College of Philadelphia, and probably the first professor of these subjects in any American college. Jefferson, himself, paid a large part of the expense of the expedition; Congress allowed only $2500. Some of the seeds of new plants brought back by Lewis and Clark grew later at Monticello, but many more went to Bernard McMahon, botanist and nurseryman of Philadelphia, and to William Hamilton, owner of the famous Philadelphia gardens, Woodlands. "I have fine plants," writes McMahon in 1808, "of all the varieties of currants (7) and gooseberries (2) brought by Governor Lewis, and of about 20 other new species of plants, as well as 5 or 6 new genera."

The leading naturalist of that day was the Count de Buffon, whose scientific word was law, in Europe. Nothing better illustrates the condition of the natural sciences than Jefferson's refutation, in *Notes on the State of Virginia*, of Buffon's theory that animals in the new world become smaller in size because the cold, moist climate is unfriendly to growth. Jefferson sent the great man a copy of *Notes on the State of Virginia*, which the Count failed to acknowledge. Then Jefferson sent him the skeleton and skin of a Vermont moose!

In the year 1796, Jefferson was elected Vice-President of the United States. When he went to Philadelphia to be inaugurated, he carried

The Thomas Jefferson Memorial, in Washington, D.C., is part of the National Capital Parks system and was dedicated April 13, 1943, the two-hundredth anniversary of Jefferson's birth. The structure typifies the style of architecture that Jefferson so admired.



A collection of the fossil bones of "*Megalonyx Jeffersonii*" on deposit at the Academy of Natural Sciences of Philadelphia by the American Philosophical Society, of which Jefferson was president.

with him a collection of fossil bones found on the floor of a cave in Greenbriar County, in what is now the State of West Virginia. He had obtained the collection for presentation to the American Philosophical Society, the oldest learned society in the country. The week after his inauguration, he read before the Society a paper entitled: *Memoirs on the Discovery of a Quadruped in the Western Parts of Virginia.* He called it the *Megalonyx* or Great Claw. The specimen is still preserved in the Academy of Natural Sciences in Philadelphia, although not now on exhibition. Dr. Caspar Wistar, the Society's curator and authority on fossil bones, in 1799 described the bones more accurately as those of a giant sloth.

The science of paleontology was still in its infancy. The huge tusked animal whose remains were being discovered in many sections of the country was believed by European scientists to be identical with the woolly mammoth of northern Europe. Nature could not possibly have created a second kind! Jefferson felt sure that the scientists were wrong. But it was too early for theories. "The moment a person forms a theory," he wrote, "his imagination sees, in every object, only the traits that favor that theory. . .We must wait with patience till more facts are collected."

Meanwhile, he was an ardent bone collector. In the shadow of the Shawaungunk range, which lies south of the Catskills, is a little village called Shawaungunk, after its sheltering hills. During the Revolution, farmers in the vicinity began to use earth of the large peat and muck deposits for fertilizer, finding in the process bones of eight or ten "mammoths" in a bad state of decay. But in the year 1800 they came on a clay bed and some better-preserved bones. Early in February, 1801, Jefferson forwarded to Dr. Wistar a letter from Chancellor Robert R. Livingston, who lived some thirty miles away. . . ."When I first heard of the discovery I made some attempts to possess myself of them, but found they were a kind of common property, the whole town having joined in digging for them till they were stopped by the autumnal rains. They entertain well grounded hopes of discovering the whole skeleton. . ." Some of the Shawaungunk bones finally helped to complete Dr. Wistar's "mastodont" skeleton.

In the Academy of Natural Sciences is a specimen whose label is almost certainly in the handwriting of Meriwether Lewis. It reads: "petrefed jaw of a fish or some other anamal found in a cavern (some distance) a few miles distant from the Missouri. (the) S side of the river—6th of August 1804."

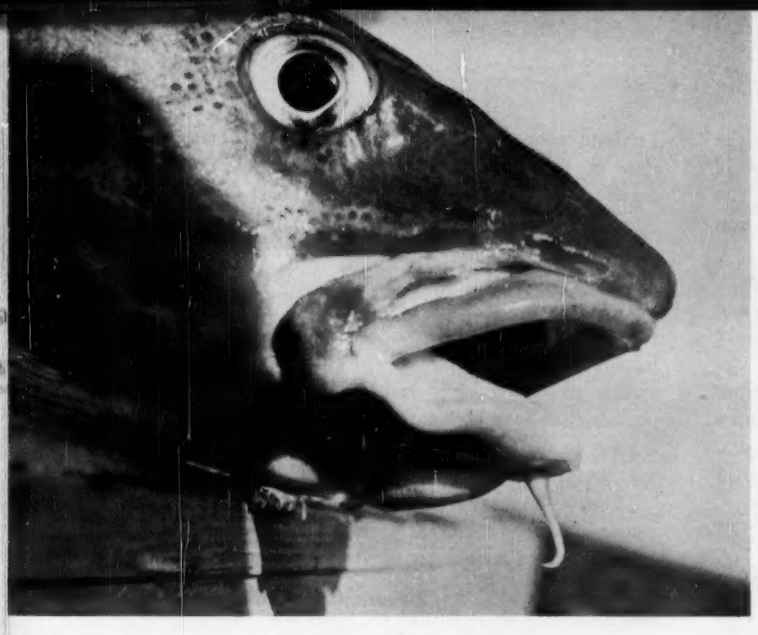
This was the fossil fish later described as *Saurocephalus lanciformis*, apparently the only vertebrate fossil collected by the expedition that has been preserved. The fate of the bones of a mososaur or plesiosaur, found the following month on the Missouri and sent to Washington, is not known. Clark's journal for July 25, 1806 notes the finding, at a place marked on the map as "White Clifts," north of the Yellowstone River, of "pieces of the rib of a fish which was Semented within the face of the rock." His clew was not then followed up, and the dinosaur remains in this area were not scientifically discovered until the eighteen-seventies.

In the year 1807, Captain George Rogers Clark, employed by Jefferson, went to Big Bone Lick on the Ohio River and engaged ten laborers, who dug bones for several weeks. Their finds were shipped, in three great boxes, down the Ohio to New Orleans, and thence to Washington. There they were spread in a large unused room in the White House, "where," writes Jefferson to Dr. Wistar, then professor of anatomy, midwifery and surgery at the University of Pennsylvania, "you can work at your leisure, undisturbed by any mortal."

Jefferson found it extremely difficult to believe in the passing of a species. The "Mastodont," the "Great Claw," might still be living in the far, unknown northern forests. "The movements of Nature are in a never ending circle," he writes in his paper on the *Megalonyx*. "The animal species which has once been put into a train of motion is still probably moving in that train. For, if one link in Nature's chain might be lost, another and another might be lost till the whole system of things should evanish by piecemeal."

Perhaps his long study of the Indians, their languages and culture made him credit just a little, against reason, the legend told by a delegation of Delaware Indians to the Governor of Virginia, who inquired of them concerning finds of ancient animal remains.

"In ancient times a herd of these tremendous animals came to the Big Bone licks, and began a universal destruction of the bears, deer, elks, buffaloes and other animals which have been created for the use of the Indians: that the Great Man above looking down and seeing this, seated himself on a neighboring mountain, on a rock of which his seat and the print of his feet are still to be seen, and hurled his bolts among them till the whole were slaughtered, except the big bull, who presenting his forehead to the shafts, shook them off as they fell; but missing one at length, it wounded him in the side; whereon, springing round, he bounded over the Ohio, over the Wabash, the Illinois and finally over the Great Lakes, where he is living at this day." ❦ ❦ ❦



The codfish was an important item in the economies of the United States and Canada in earlier days, and although there has been a marked decrease in the cod population on the Grand Banks, millions of pounds of codfish still are landed annually.

# The Omnivorous Codfish

By BERNARD L. GORDON

*Photographs by the Author*

On March seventeenth, 1784, John Rowe, a Boston merchant, introduced a motion in the Massachusetts legislature to the effect that: "Leave be given to hang up the representation of a cod-fish in the room where the House sits, as a memorial of the importance of the Cod-Fishery to the welfare of the Commonwealth." The motion was carried, and the effigy of a codfish, carved from pine, was exhibited opposite the Speaker's chair in the chamber of the House of Representatives in the Massachusetts statehouse in Boston, where it hangs today. Many years later, an aluminum codfish was placed in the Senate chamber, as an additional emblem of the State's fishing industry.

Probably no other item of commerce played a more important part in the early economies of the United States and Canada than this fish. In fact, during the century before the landing of the Pilgrims on the American shore, more than 300 French, Basque, Portuguese, Spanish and English fishing vessels traveled across the Atlantic to Newfoundland waters every year to catch codfish.

Captain John Smith, trying to entice settlers to the New World, wrote, "And is it not a pretty sport to pull up two pence, six pence, and twelve pence as fast as you can haul and vere a line; he is a very bad fisher who cannot kill in one day one, two or three hundred cods, which dressed and dried be sold for ten shillings a hundred. . . Therefore honorable and worthy countrymen, let not the meanness of the word fish distaste you, for it will afford as good gold as the Mines of Guiana or Potassie, with less hazard and charge, and more certainty and facility."

The principal locality for cod fishing, in North Atlantic waters, is a great shoal known as the Grand Bank, lying about 100 miles off the southeast coast of Newfoundland. The Grand Bank is also known as the Grand Banks and the Great Banks, and covers an area about the size of the State of Pennsylvania. The Bank is about 300 miles long, is less than 100 fathoms below sea level, and projects southeast from Newfoundland toward the center of the Atlantic. The region is rich in plankton, brought in by ocean currents, making it one of the favorite haunts of the capelin, a sardine-like fish that is a favorite food of the cod. Many invertebrates, like mollusks and crustaceans, also abound here.

The common cod, *Gadus morrhua*, described by Linnaeus in 1758, is found in the North Atlantic around Greenland, Iceland, and Spitzbergen, and south to the North Carolina coast. It is especially abundant on banks and ledges such as Grand Bank, George Bank, Brown Bank, Grand Manan, Jeffrey's Ledge, Cashes Ledge, and other rocky areas off the northeastern coast.

The cod is an omnivorous fish, feeding on both plant and animal organisms. Young cod feed on Irish moss and other algae, in addition to their regular diet of copepods. Mollusks form a large part of the adult cod's diet, and, if both large and small shell fish are available, the cod appears to choose the large mollusk. Sea clams are eaten in large numbers. They are swallowed whole,

and the acids in the stomach of the fish digests out the meat. Empty clam shells have been found in piles of six or seven, stacked like abandoned desert dishes in the stomach of a cod, or expelled and stacked on the ocean bottom.

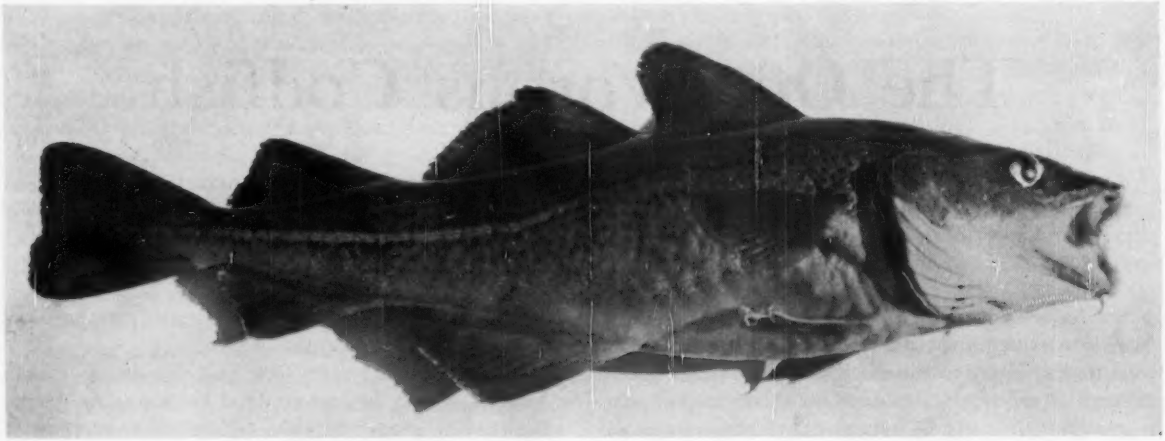
The codfish seems partial to crabs, shrimp, lobsters, sea urchins, brittle stars, sea cucumbers, sand worms and squid, as well as almost any small species of fish like herring, shad, mackerel, launce, capelin, menhaden, alewives, whiting, or even their own young. The Gloucester *Telegraph* for May 6, 1857, tells of a Mr. James Osborne, who, on dressing a sixty-pound codfish, found it had swallowed two full-grown ducks that still had most of their feathers.

Many foreign objects that hardly could be classified as nutritious have been taken from cod stomachs, including old books, rope, oil cans, scissors, rocks, corn cobs, rubber dolls, parts of old boots, a cigarette case and false teeth. The Boston *Journal* for July 9, 1871, tells of a St. Johns, Newfoundland, fisherman who found a wedding ring in a cod's entrails that had belonged to a woman lost on the steamship *Anglo Saxon*, wrecked off Chance Cove, Newfoundland, ten years earlier. The lucky fisherman received a reward of fifty pounds for returning the highly prized memento to the missing lady's son.

The coloration of cod generally ranges from greenish to red-brown, depending on the habitat of the individual. Specimens living in the vicinity of kelp and other seaweeds generally tend to a darker color that more closely resembles that of the weeds. Some of the distinguishing features of the codfish are the mottled spots on the sides, the three dorsal fins, two anal fins, a broom-shaped tail, a pale lateral line, and a distinctive barbel on the chin. The fish are found in depths as great as 250 fathoms, but most cod fishing is done at depths of between ten and seventy-five fathoms.

Codfish vary greatly in size and weight. According to Brice (1897), the largest cod recorded from New England waters weighed 211½ pounds, and was more than six feet long. This enormous fish was taken on a trawl off the northern Massachusetts coast in May, 1895. Another fish, that weighed 136 pounds when eviscerated—and probably 180 pounds alive—was taken in 1838, on Georges Bank. Goode (1884) mentions five codfish taken off the Massachusetts coast during the nineteenth century that ranged from one hundred to one hundred and sixty pounds. The twentieth century seems unable to produce any records of codfish over ninety pounds that have been taken off the New England coast. Today, in the Gulf of Maine, a large codfish is one that may weigh forty pounds.

The fish are marketed in three distinct size categories. Those known as scrod are generally young cod weighing from one and a half to two and a half pounds; so-called market cod run from two and a half to ten pounds; and large cod are fish that are more than ten pounds in weight. Those of forty pounds or over are classified as whale cod.



Mottled spots and a pale lateral line are distinguishing features of the codfish, along with the three dorsal fins, a broom-shaped tail, and the distinctive barbel on the chin.

The codfish seems to be one of our most prolific animals. The ovaries from a twenty-one pound cod have been computed to contain 2,700,000 eggs, and those of seventy-five pound cod, 9,100,000 eggs. The eggs are rather small, about one-eighteenth of an inch in diameter, about 337,000 of them making a quart.

After fertilization, the eggs hatch in about seventeen days, and in three years the fish are fully mature. On Georges Bank, young cod grow to about seven and one-half inches during their first year, and reach about fifteen to sixteen inches by two years of age. There is generally a spawning migration to inshore waters during the winter months. Tagging has shown that cod which spend the summer on Nantucket Shoals migrate in mass to the coasts of southern New England, New York and New Jersey for spawning. In the spring, they return to Nantucket Shoals. The longest cod migration on record is that of an individual, tagged in Iceland, that crossed the Atlantic and was recaptured in Newfound-

land, a distance of 2000 miles from its starting point.

The name *cod* seems to be derived from the Gaelic *gad*, meaning a rod, or short stick, perhaps in allusion to the practice of hanging the sun-dried cod, split and stretched, on a short stick. The Basque word for codfish was *baccalaos*, from the Iberian *baculeum*, meaning small stick. Old time New Englanders have sometimes referred to the codfish as "Cape Cod turkey."

During the past two centuries, drying and salting cod was the only economical way of preserving it for wide distribution, and most of the New England fishing schooners went to the Grand Banks and vicinity to obtain cod by long line. During the nineteenth century, it was customary for Yankee fishermen on the Grand Banks, and in the Gulf of St. Lawrence, to land on the rocky shores of Newfoundland and the other British provinces to cure their fish. The fish were split, salted and stacked in the vessel while on the banks, and, on landing, the cargo was dried on the rocky beaches. After the fish were cured, many were carried directly from the provinces to Spanish and other European ports, where they were sold or traded, and a return cargo of foreign merchandise brought home.

The privilege of landing to cure fish in the Provinces was considered valuable, and was the subject of much international controversy. By the treaty of 1818, the fishermen of the United States were allowed to land and cure their fish within certain prescribed limits, which were later extended by the Washington Treaty of 1871. Today, the privilege of landing is unimportant, because modern fishing boats have freezing compartments, or large supplies of ice, and bring the catch directly to home foreign.

On the old-time Grand Banks fishing schooner, a so-called dressing gang prepared the fish as soon as the dories brought in their catch. This gang consisted of a "throater," a "gutter" and a "splitter." The throater, taking the cod by the head with the left hand rested on the tub, made a transverse cut across the throat, immediately behind the gills, with a strong, sharp-pointed knife. Introducing the knife into this opening, he cut down the belly, opening the abdominal cavity. He then cut around the neck, and separated the head from the body at the first vertebra.

The gutter, taking the fish, opened the abdominal cavity with his left hand, and with his right, tore loose and removed all the organs in the abdomen. The livers were thrown into a separate receptacle, while the stomach and other organs, with the head, were thrown to the sea gulls, or chucked into a "gurry-pen" on the deck.

The fish then passed to the splitter, who made a long incision down the ventral surface, continuing the cut made by the throater. He also removed the upper half-backbone by cutting around it and pulling it out. The air bladder was then removed, and the fish washed in sea water. Fresh water is not used for washing, even if it is plentiful, because it tends to make the fish slimy.

The French naturalist Cuvier stated that "The Norwegians give cod heads with marine plants to their cows for the purpose of producing a greater proportion of milk. The cod vertebrae, the ribs and the bones in general are given to their cattle by the Icelanders and by the Kamtchatdales to their dogs. These same parts when properly dried are employed as a fuel in the desolate steppes of the icy sea."

Today, cod are taken with lines, gill nets, floating traps and pound nets, in addition to those landed by otter trawlers, and are marketed principally as fillets, either fresh or frozen. In addition, there is shredded codfish, codfish flakes, salt cod, pickled cod, green or smoked cod, and pickled cod tongues. Cod liver oil, rich in vitamin D, is used in vitamin pills, and in some industrial processes.

During 1954, United States fishermen caught thirty-seven million pounds of cod, bringing a revenue of $2.2 million to the fishermen. In the twentieth century, cod landings in New England fishing ports have declined to about one-fifth of their former level. There is strong evidence that this decrease in abundance is associated with a warming trend in New England waters in recent years.

At the present time, the United States is participating in a large scale international research program that entails the study of local American and offshore cod stocks, and the United States Fish and Wildlife Service currently is concerned with the solution of problems dealing with the determination of rates of increase or decrease, growth, and mortality among the cod population in New England and other offshore waters.

## RED-WINGED BALLADIERS

*You mount your cat-tail podiums*
*With springtime in your throats*
*And soon my little lake is ringed*
*With vibrant, vying notes.*
*And though the undecided day*
*May still be tinged with snow,*
*I don a scarlet walking coat*
*To share your bravado!*

Emeline Ennis Kotula

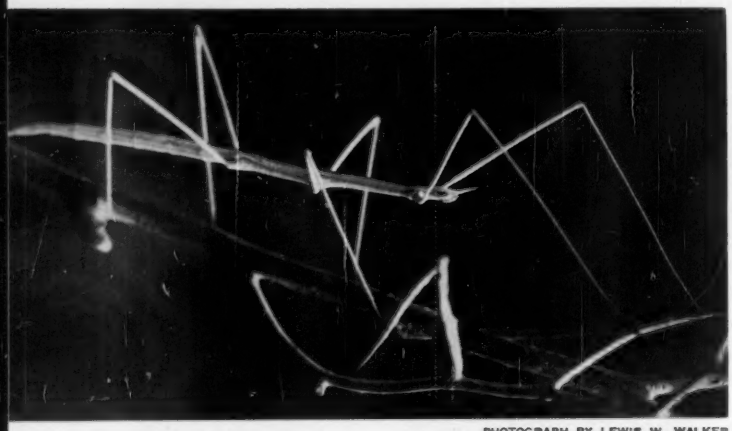
# Insects Can Be Fun

By ALVAH PETERSON

MEN ARE earthbound creatures, except when they project themselves through space in airplanes and other vehicles, and naturally they have always marveled at the remarkable flight achievements of the flying animals. It is no wonder, then, that the study of birds in the United States has enjoyed such a large following among people from all walks of life.

But a corresponding enthusiasm on the part of adult amateur naturalists for the great segment of the earth's life that is known under the term "insect" has never materialized in the United States. Amateur entomologists among the men and women of this country are few and far apart, and there are almost no local insect clubs or societies in our towns and cities.

This lack of enthusiasm is difficult to explain, in view of the fact that elsewhere in the world the story is quite different. For example, in Japan, England, Denmark, Switzerland, Sweden and other countries thousands of men and women, from all walks of life and of all ages, are insect enthusiasts. They belong to local insect or Nature clubs, where they exchange experiences and swap specimens. They participate in field trips for the purpose of observing and collecting living insects. Some of these groups produce publications where members may publish their findings. In Japan, there are more than 500 insect clubs, or societies, made up of amateurs. Most high schools have such clubs, and many large cities support from one to five amateur insect societies, made up of adults from many occupations. The same may be said of England and other countries. In England, more than 600 Nature clubs exist, and many of the members are insect enthusiasts. One outstanding amateur society, called the South London Entomological and Natural History Society, has more than 500 members, of which ninety-five per cent are amateurs.



PHOTOGRAPH BY LEWIS W. WALKER

The curious insect commonly known as the "walking stick" may be either brown or green, and looks so much like a twig that it takes a sharp eye to detect it. The walking stick feeds on tree leaves, and its egg-laying program is simple—it merely drops its eggs on the ground.

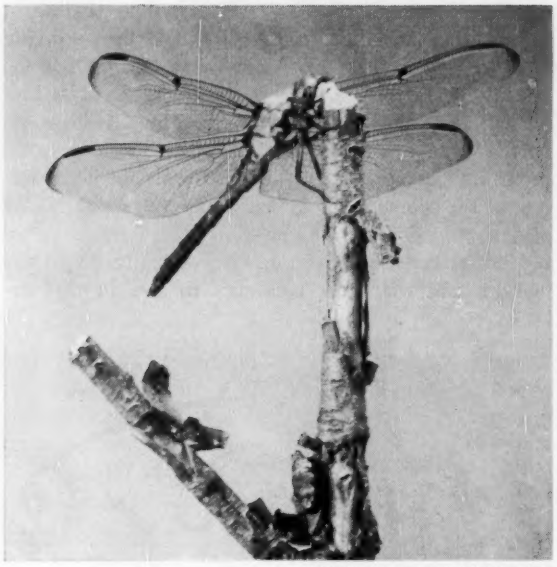
The amateur entomologists in foreign countries find it hard to understand why there are so few non-professional adults in the United States who are enthusiastic about insects. Their thinking is reflected in the comment of one Englishman, who said, "Your amateurs are beginners, chiefly children. You need to grow up and enjoy the wonders of the insect world as adults. You have extensive natural habitats for insects, certainly far greater than what we have in England. Why don't you explore them?"

In the United States, where records are available, the total number of insect species exceeds greatly the combined species of all other animals. For example, in the State of Ohio, there are approximately 320 species of birds, 160 species of fishes, seventy-two species of frogs, toads, salamanders and reptiles, and fifty-five species of mammals. No definite count has been made of the number of species of insects that live in Ohio, for example, yet a conservative estimate would be 15,000.

Insects are easy to catch and preserve in good condition for many years. The author has in his personal collection specimens that were captured, killed and pinned in 1907, and they are still in good condition. Flying, crawling and aquatic insects may be collected by nets, light traps and bait traps, and they may be killed easily by the use of dry heat or toxic fumes.

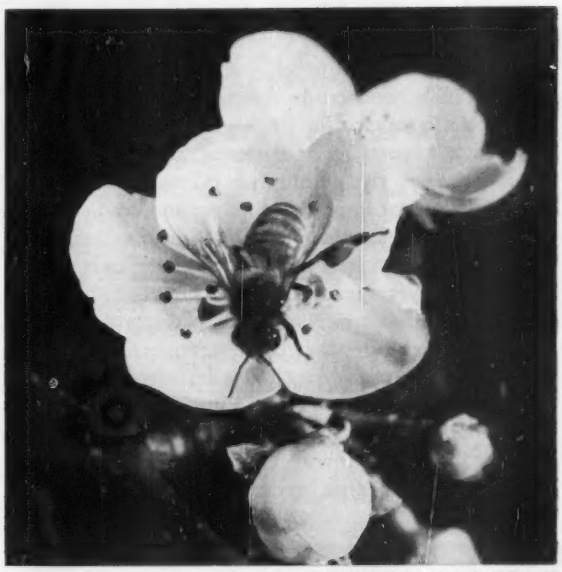
A simple way to kill beetles, flies, wasps, sucking bugs and other species that are not large is to place the living insect in a test tube, a small round vial, or a tiny metal container, and submerge the container in hot water (near boiling). Within a few seconds the insect will be dead. If no water has entered the container, the dead specimen will be dry, relaxed and in good condition for pinning or mounting in any position one may wish.

In case one uses toxic fumes to kill insects, the safest and best are ethyl acetate and carbon tetrachloride. The author prefers ethyl acetate. This product is highly volatile, kills quickly, and produces specimens in good condition for pinning and mounting. This volatile chemical, or carbon tetrachloride, may be poured into a bottle containing several layers of blotting paper or



PHOTOGRAPH BY EDWIN WAY TEALE

The dragon fly or darning needle is one of Nature's most accomplished aerial performers, darting about over ponds in its pursuit of small insects, which it scoops up in a "basket" formed by the legs and front of the thorax.



PHOTOGRAPH BY ROSS E. HUTCHINS

One of the important agents for the pollination of flowers is the honeybee, one of the social insects that has evolved a well-ordered way of life. The honeybee's food consists of nectar and pollen, while honey is made for its larvae.

paper toweling, and then sealed with a cork or a tight-fitting screw cap. The author prefers to use a wide-mouth bottle with a one-half inch layer of dry plaster of Paris on the bottom. To make a killing bottle, pour a thick mixture of plaster of Paris and water into the bottle. Allow it to set and harden. Before the bottle is used, dry out the plaster of Paris in the bottle. This can be done rather quickly by placing the bottle in a warm oven, or in front of an electric fan. When dry, place one or two tablespoonfuls of ethyl acetate on the dry absorbent plaster of Paris. Seal the bottle and keep it closed when not in use. One charge should be sufficient for one or two field trips. When insects are killed in a bottle charged with ethyl acetate, the specimens may be kept in the bottle for twelve to twenty-four hours without producing any damage, provided the bottle is not too crowded with dead specimens.

Most insects are easy to preserve because they possess an exterior skeleton, which, when dead, dries and usually retains its normal shape and color. This is the reason why insects on pins remain in excellent condition for many years.

Some insects may be reared easily and continuously, in great numbers if desired. Others are easy to rear for a part of their life cycles. For example, moths can be reared from field-collected cocoons, flies from puparia, dragonflies from full grown nymphs, grasshoppers from egg pods, parasitic wasps from host larvae; and there are many other possibilities. Rearing is fun, and may be profitable, especially for those who use insects to feed animal pets, or for the fisherman who rears insects for bait. Among species that are easy to rear are meal worms, waxworms, crickets, grasshoppers, and blow-flies, to name a few that are familiar to most people.

Most insects can fly, some with great agility. Have you ever watched a dragonfly catch midges or mosquitoes in mid-air, or two damsel flies cruise in tandem over water as the female deposits her eggs, or a robber fly pounce on a living honeybee in flight, or a sphinx-moth hover before a flower, like a hummingbird, and insert its uncoiled proboscis into the flower for nectar?

Singing or chirping is common among insects, and sound records have been made of more than 250 species. On almost any warm evening, in late summer, one may hear many insect songs or chirps, especially the continuous trill of tree crickets, the chirpings of field crickets, the saucy note of the katydid, and the pronounced song of the cicada. If you want an insect songster for the home, capture one or more male field crickets or house crickets. Place them in a small screen, or cloth-covered cage, and provide them with a continuous supply of green lettuce. As soon as they become adjusted to their new environment, they will chirp for several months.

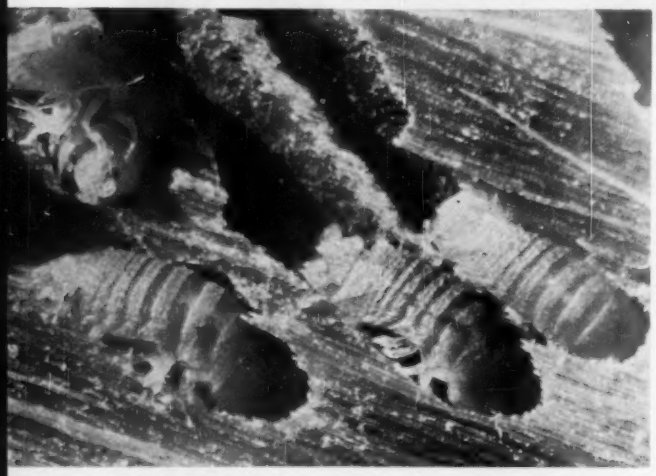
Many insects are endowed with beautiful colors and highly ornate patterns. This is especially true of many butterflies, moths, beetles, wasps, sucking bugs, and leafhoppers. To see these unusual colors and their designs on small insects, one should have access to an inexpensive magnifying glass that will increase the size of the insects by five or more times. Some insects are remarkable for their grotesque shapes, and their presence in a collection adds much to its attractiveness and value. Brightly colored and unusual insect specimens are used today in the production of jewelry, colorful toys, plastic tableware, and pictures, and it is interesting

to note that insect designs, colors or shapes are now common in such items as wearing apparel, tablecloths, window curtains, wallpaper, and greeting cards.

Insects make wonderful subjects for the photo-hobbyist, especially for close-up shots. With a 35 mm. single-lens reflex camera with extension tubes and supplementary lenses, the author has taken interesting and beautiful shots of insects, both alive and dead.

The life cycle of an insect may be as short as seven days, as in the house fly, fruit fly or egg parasite, or it may require several years, as that of the June bug, hellgrammite, or wood borer. For a distinctly prolonged life cycle, one might cite that of the seventeen-year cicada. Eggs of the seventeen-year cicadas deposited and hatched in 1958 will not appear as adults until the year 1975.

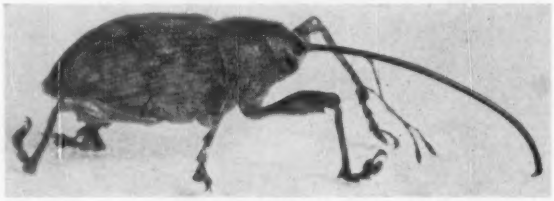
The life histories of many insects are unusual, as evidenced by the following two examples. A species of *Donacia* is a leaf-feeding beetle. The female eats a small,



Throughout the tropics and in most of the warmer temperate climates of the world is found the termite, whose colonies often come into conflict with man's interest when they invade the timbers of his home.

round hole in the floating green leaf of an aquatic plant, being especially partial to the spatterdock and the water-lily. After the hole is made, the female inserts her abdomen through the hole, and deposits a number of eggs about the margin. These eggs are in contact with water, so that when they hatch, the larvae crawl or swim to the bases of plant stems that may be two to five or more feet below the surface. The larvae insert their anal breathing hooks into the plant, to obtain their oxygen. They remain in this position until they are full-grown. When full-grown, each larva spins a thin brown cocoon about its body, and transforms into a pupa. When ready to emerge, the adult beetle eats its way out of the cocoon, and swims to the surface of the water, where it lives a terrestrial and aerial life. It repeats this life cycle when the female eats deposition holes in the foliage, and deposits eggs.

Another fascinating insect that lives in water is a small aquatic moth, *Catoclysta*. In early June, and again in August, the adult moths flit about low-growing willows along swiftly moving stony streams. When the moth is ready to deposit eggs, apparently it dives into the rapidly moving water and swims down to the rocks on the bottom, where it deposits eggs. When a caterpillar hatches from an egg, it crawls over the under surface of the submerged rock and locates a small shallow depression. Over this depression it constructs an irregular, silken web covering, with openings about the margin, and the larva continues to live in this de-



Have you ever opened a hazelnut and found a worm instead of a nut? The queer looking insect above, with the long, slender snout had been there before you, and had laid an egg in the nut that hatched into the little white grub of the hazelnut weevil.

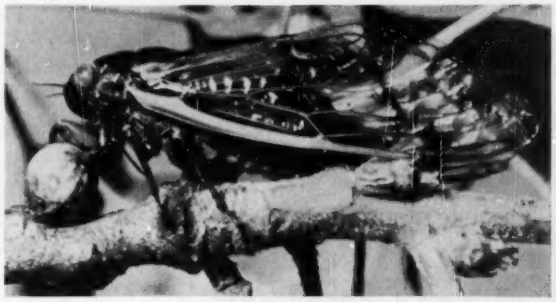
pression until full-grown. Its food consists of microorganisms that are washed into its domicile through the openings about the margin, and the caterpillar obtains its oxygen from the swiftly moving water through numerous tiny, hair-like gills scattered over the body. When full-grown, the larva contracts its home and transforms into a pupa, and when ready to emerge the pupa forces its way out of its residence, swims to the surface and emerges as an adult. From this point, it is a free-living aerial moth. When the females are ready to deposit eggs, they enter the water again and start a new life cycle.

These insects illustrate two of the interesting aquatic species. Terrestrial insects also undergo life cycles that are equally fascinating, especially species that are parasitic on other insects.

Entomologists in this country lead the world in chemical control of injurious insects. With the help of chemists, they have produced highly toxic sprays, and dusts that will kill most insect pests. When these potent toxins are applied to crops for the control of given pests, they also destroy or reduce the efficiency of numerous beneficial parasites, insect predators and bees. Such toxins are not unmixed blessings, for they frequently create new insect and mite problems, and upset the balance of things.

The slogan of the entomologists since 1953 has been "Kill Your Insect Enemies"—a saying that has created, in the minds of many people, the idea that most insects are injurious. The author has had many experiences with the public which indicate strongly that many people believe this.

For example, last summer I was in a parking lot in



The hot days of late summer bring the high-pitched "song" of the adult male cicada, produced by the vibration of membranes over a pair of sound chambers on each side of the abdomen.

front of a large super market when a man came out of the market, with his arms filled with groceries and his young son trailing close behind. The father spotted an insect on the ground. Pointing with his foot, he called to his son, "Bad bug, step on it,"—and the son proceeded to do so. I was curious to see what kind of an insect called for such drastic action. A close examination showed that the crushed specimen was a large, irridescent, and beneficial ground beetle, of the species *Calosoma*.

I was in a barber shop once when the shoeshine boy grabbed a fly swatter and proceeded to kill several flying insects. Upon examination, the killed specimens proved to be ensign flies, which are parasitic upon cockroach egg masses. It was evident that the shop contained cockroaches, possibly the large American roach.

Last summer, a distraught housewife came to my office with a tale of woe. She showed me some long thin, round, legless white worms with distinctive small heads. She had found them in some upholstered furniture that was badly riddled. Naturally, she thought these creatures had produced the injury. It required considerable explanation to convince her that the larvae were beneficial insects. They had been feeding on the larvae of the clothes-moths that had produced the damage! The adults of these long, thin larvae are scenopinid or window flies, occasionally seen on the windows of homes infested with clothes-moths. It seems that applied entomologists should modify their slogan to read "Know your real insect enemies, then kill them."

The overall antagonism of the general public toward insects, both good and harmful, might be changed if entomologists and naturalists would publicize more extensively the facts about the useful and beneficial insects, and show how they serve mankind.

Beneficial insects far outnumber the injurious forms. In fact, our serious pests constitute less than two percent of all the insects in a given community. More than fifty kinds of plants that produce food for man and his animals could not be grown if insects failed to transfer pollen from one plant to another. Many predacious and parasitic insects prey upon other insects, controlling or holding in check many injurious species and potential pests. Other insects produce products that man uses extensively, like honey, beeswax, silk and dyes. Still others are scavengers, and help convert dead plants and animals into organic debris that plants and other organisms may use as food. Many species serve as essential food for birds, fishes, lizards, toads, field mice, shrews and other wild animals. They are especially important in the growth and development of most young song birds, and young game and pan fishes. Insects are used extensively by man in various biological laboratories for testing the toxicity of chemicals, in bioassay analyses, studies in genetics, animal physiology and medicine.

Entomological literature is filled with fascinating and unusual facts about insects, and the old naturalists' slogan "study Nature, not books" is particularly applicable to the amateur entomologist. Here is a field that has proved highly rewarding to students of Nature—young and old alike—in other parts of the world. Perhaps Americans are missing something that they might find most enjoyable!

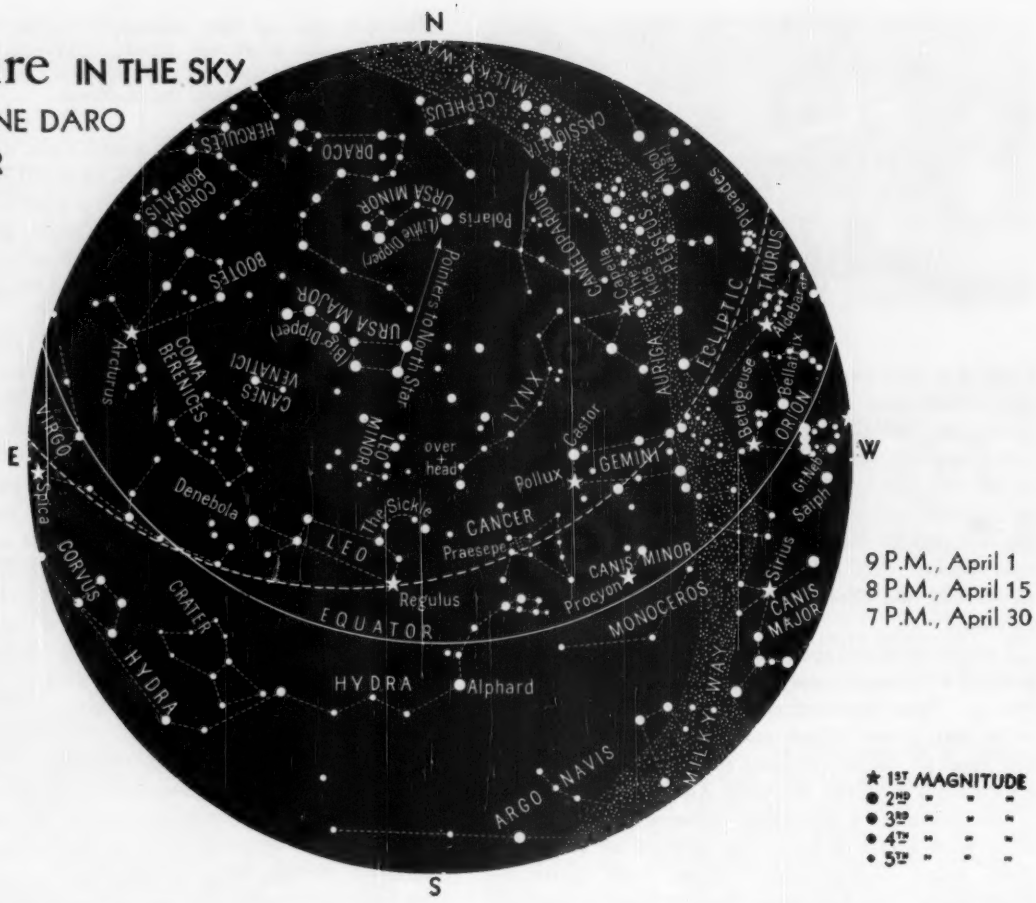
## LAVENDER FOR SPRING

*Summer is the color of all gold*
*And ripening things: a yellow rose full-blown,*
*A laden pear-tree, warblers. Autumn's own*
*Shade is the sugar maple's flame and scrolled*
*Chimneysmoke against a russet sky,*
*The garnet flare of late crysanthemums*
*And sumac apple-red. With winter comes*
*The misty blue of dusk when shadows lie*
*Beneath snowbanks, the blue-white of a gale.*
*But meant for early spring is lavender*
*(Its green comes later on). Beneath the fir*
*And pine, crocus and violet lift frail*
*Faces serenely, for they evoke all*
*Nature's beginnings, delicate and small.*

Jane Morrison

## Nature IN THE SKY

By SIMONE DARO GOSSNER




To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

# The Great Star Catalog Case

THIS IS NOT a murder story, but the case went to court, and stands unique in the annals of astronomy and probably of jurisprudence. It all happened seventy years ago, at the Litchfield Observatory of Hamilton College, in Clinton, N. Y.

The central figure in the case, plaintiff and villain, was C. H. F. Peters, director of Litchfield. Christian Heinrich Friedrich Peters was born in Denmark, in 1813. After obtaining a doctor's degree at the University of Berlin, he tried vainly to be appointed at the Copenhagen Observatory. Successively, he did post-graduate work at the University of Gottingen, Germany, took part in a survey of Mount Etna, and eventually became director of the Trigonometrical Survey of Sicily. A few years later, he sided with Garibaldi in the revolt of 1848 against the King of Naples. The revolt failed, making it necessary for him to flee to Malta. The following year saw his brief return to Sicily cut short by the fall of Palermo, which sent him fleeing to France, and from there to Constantinople. The Sultan was ready to send him on a scientific expedition to Syria and Palestine, when the outbreak of the Crimean War, in 1854, put an end to *that* venture.

Restless as ever, Peters embarked for the United States where, for the next four years, he was employed successively in Cambridge, Washington and Albany. His ceaseless wanderings came to an abrupt end when, in 1858, he accepted the post of director of the Litchfield Observatory at Hamilton College.

He devoted much of his time to the observation of

asteroids. In the course of his work, he found it necessary to check the position of a considerable number of reference stars. Most of those stars had not yet been cataloged systematically, and thus it was that Peters conceived the idea of preparing a huge star catalog, gathering in one publication all the positions of stars published here and there in the astronomical literature.

The idea in itself was not an original one. Star catalogs have, of course, been used for centuries. The only value of such a piece of work resides in the considerable amount of labor it involves. Peters succeeded in persuading his young assistant, Charles A. Borst, a graduate of Hamilton, to undertake this thankless job. Borst was working for a mere pittance of a salary, but, spurred by the academic credit this would bring him, he attacked the task with unflagging enthusiasm. Taking the work home, he enlisted the help of his sisters Lucy and Emma to perform a large part of the calculations and do most of the copying. More than a thousand pages of the manuscript were in Miss Lucy's own handwriting.

FROM "PTOLEMY'S CATALOG OF STARS"

C. H. F. Peters, director of the Litchfield Observatory of Hamilton College, was the central figure in a court case unique in the annals of astronomy.

At the beginning of 1888, after several years of diligent work, Borst reported to Peters that the manuscript was ready. Eagerly, he submitted a tentative title page naming Borst and Peters, respectively, as author and editor. In a sudden burst of temper, Peters threw the page into the stove and curtly ordered Borst to bring him the manuscript. Upon the latter's refusal to comply, Peters took the matter to court, and sued the Borst family for return of the manuscript and all relevant papers.

The astronomical world, on both sides of the Atlantic, was stunned by Peters' action. It is the accepted practice in scientific matters to give proper credit to those who contribute to a piece of research. Sentiment, in general, ran in favor of Borst. Simon Newcomb, among others, in spite of a long friendship with Peters, did everything in his power to persuade him to drop the suit. He even suggested that the matter be referred to a council of astronomers, who would judge the merits of the case. Newcomb's argument, amply confirmed by the later developments of the case, was a very sound one. He contended that a group of astronomers, having professional knowledge of the details of the case, would be better qualified to pass judgment than any court of law. Peters, however, would have none of this.

In January, 1889, the case was tried before Judge Williams of the State Supreme Court at Utica, New York. The attorney for Peters was Elihu Root, who later became Secretary of War under McKinley, and Secretary of State under Theodore Roosevelt. Root was a former graduate of Hamilton College, and a friend of Peters. The Borst family retained as attorneys the firm of the former U. S. Senator Kernan, of Utica.

The court spent more than a week listening to the testimony on both sides. A number of distinguished witnesses were called, among them Lewis Boss, director of the Dudley Observatory in Albany, and Asaph Hall of the U. S. Naval Observatory. The line of reasoning followed by Judge Williams is perhaps the most baffling feature of the whole case. The defense had argued that since both Borst and Peters were employes of Litchfield Observatory, their work belonged to that institution, and only the corporation of Hamilton College should have the power to bring the suit. The judge ruled the argument invalid, because the salary paid to Peters was so low that the man should be entitled to the results of his own work. Strangely enough, the judge failed to apply the same principle to the rights of the defendant, who was paid even less, and of his sisters, who were paid not at all.

In November of that year, Judge Williams decided the case in favor of Peters, and ordered return of the manuscript. Furthermore, the court painstakingly outlined what it considered to be the manuscript's monetary value—including, believe it or not, the value of the work performed by Lucy and Emma Borst—and condemned the defendant to pay interest on this assessed value for the period Borst had refused to surrender it.

The defense appealed the case to the higher courts. Eventually, the decision was set aside by the New York Court of Appeals, on the grounds that Borst's rights had been ignored. This opened the way for a new trial, but Peters had died in the summer of 1890, and his heirs did not choose to resume the suit.

The Litchfield Observatory is no more. Its telescope is gone. Only the pier on which it was mounted remains standing, a forlorn relic of busier days.

Ironically, the catalog was never published.

In the month of April, the moon will be full on April 4, and the New Moon will occur on April 19.

Mercury will be an evening star at the beginning of April, setting one and one-half hours after the Sun on April 1. Rapidly approaching the Sun, it will enter the morning sky on April 16. By the end of April, it will rise about half an hour before sun- (*continued on page 218*)

# Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

**Encircling The World**

FOR MANY YEARS, THIS PAGE has reported things that take place at the annual meeting of the American Nature Study Society and the National Association of Biology Teachers. Last year, it was held at Indianapolis, and the field trip on Sunday, December 29, was enjoyed in perfect weather by some eighty persons at the National Headquarters of the American Camping Association, at Bradford Woods, Martinsville, Indiana. Roger Peterson, who had planned to be present, could not attend, so the group that usually "high-tailed it" over the landscape had a more leisurely experience.

The writer led a group on a "trip around the world in eighty steps," beginning in front of the headquarters building. The steps had been counted carefully a few minutes before the trip began, to guarantee the greatest variety of experiences for the time and space available. In contrast with another highly publicized "around the world in eighty days" trip this one cost nothing, once it was started, and possibly will be remembered longer by the few who took the eighty steps than by many who paid generously in cash to visit the movie and vicariously took another trip around the world by balloon, boat, train, elephant and horseback. What is more, this eighty-step trip can be taken almost anywhere under the leadership of any good naturalist with adequate field training. It should be possible around almost any schoolyard in the country.

To be perfectly honest, it must be admitted that before we quit we took more than eighty steps. However, one of the few definitions about education that I remember from my professional training was to the effect that that education is most valuable which, while giving the greatest amount of useful experience, creates the greatest desire for further useful experience. And with this in mind, there can be no serious criticism of the fact that we had no use for the busses available, and took a comfortable walk down hill to a previously agreed meeting place. Attention was called to the fact that the celebrated naturalist Rafinesque did away with taking his Nature trips by horseback, because he wasted so much valuable time getting on and off the horse. I hope that some time some statistic-minded educator will give us data on what proportion of the average time spent on a field trip is really spent profitably. The greatest criticism I have had about these annual trips was directed towards the waste of time in getting to and from the trip site.

### No large wildlife

Perhaps, to be perfectly honest again, we must admit that we did not see in this eighty-step trip any elephants, or wild bison, or whales. A road-cut, however, did show us a perfect unlabelled soil profile, with Canada bluegrass growing on sparse topsoil where Kentucky bluegrass well might have been growing, before the top soil was lost. We found out the major differences between these two grasses, and from then on almost everyone wanted help in identifying grasses in the winter condition. This lead us to recognizing grasses of European origin, as well as those native to the north and south of where we were working. It lead also to the recognition of the fact that on poor soil it may be more profitable to grow a relatively inferior Canada bluegrass than to try to grow a potentially superior Kentucky bluegrass that requires a richer soil than is available. This brought in discussions based on observations in the fields of economics, soil chemistry and soil physics.

A row of stones bordering the drive showed different flora on the northern and southern exposures, and a beautiful dendritic example of soil erosion on a patch of bare soil helped us appreciate conditions that were more extensive in other parts of our continent and of other continents. A little pool of water, a foot or so across, had frozen over. Since it had frozen, the water level had lowered, illustrating the porosity of the underlying soil, and a thermometer was used to explore the temperatures above and below the ice. The results were interesting, but not startling, because the weather was unduly mild. However, the ice provided a good series of observations associated with its transparency and translucency, and the size of ice crystals observed in some moist exposed soil along the roadside showed how large crystals are formed under conditions different from those producing small crystals. Again physics came into the picture.

### Following scents

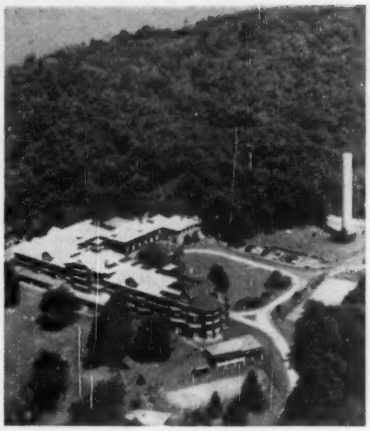
The initial experience on the trip was with a little insignificant plant growing beside the starting point. Given an opportunity, no one of the group present recognized mock pennyroyal in its winter condition, until someone happened to crush a specimen and get the characteristic odor. And with that, away we went, following scents on the rest of the trip, and getting some interesting results. I came across one plant that does not grow in my home territory, but I remembered it from my teaching experiences in the mid-West, forty years ago. Then one of the group came up with some animals he had collected from a tiny pool and had placed in a vial. There were water scavenger beetles, water sowbugs, fresh-water shrimps, and a pollywog that had me "stumped." While I was trying to remember which of the salamanders it was, Jim Fowler of the Cranbrook Institute, near Detroit, for many years connected with the Philadelphia Academy, came forward with the information that it was a marbled salamander. Then I remembered that this salamander, unlike most others, lays its eggs late in the season, and that the larval stage is spent in winter. I remembered also that its range is to the south of the area where I had done most of my field work.

To me, this new experience was possibly the most important of the trip. Unfortunately, I cannot refer you to our recent special insert on

amphibia, because I did not include the story of the marbled salamander in it. I would have known the adult salamander, but I just had not seen a living larva in its natural setting before. I have repeatedly told young teachers that it pays to keep yourself in "hot water" if you wish to keep on learning. In this case, I learned from getting into cold water. Of course, we do find the larvae of a number of amphibia in cold water in winter, but this "critter" just did not look like anything I had seen before.

To me, these field trip experiences represent the finest type of education. They are not made up of experiences of interest only to those qualified in systematic ornithology. They illustrate beautifully the interdependences of the sciences, including the biological and the physical sciences and even the social sciences associated with economics and legal matters. To me, this trip was one of the best in a long series with this group. It did not quite match a trip with the same general group a few years ago, when I announced before we made one of our stops that I would find my next lesson within two buslengths of the place we stopped. (Where that would be, I did not know, because I had never been there before.) That time I selected a bunch of grass that was a little higher than the surrounding vegetation, only to find in it the skeleton of a rabbit, whose decaying body had enriched the grass and produced the more luxurious vegetation that had attracted my attention, and I thought that it called for closer examination.

Remembering these trips, I turned on my television last night and listened to a famous science educator tell how science education would save the world. To my knowledge, this man, who has been a rather regular attendant at the A.A.A.S. meetings, has never yet been on one of our field trips. His name appears on the title page of a series of books on which I commented, on the sixth page of the ninety-third of my special *Nature Magazine* inserts. Since 1940, his books have been reporting that impossible fight between two dinosaurs that were not contemporaries. Frankly, I cannot look to salvation in the ranks of the entrenched science education leadership of the last thirty years. Let us get down to earth in these matters. Let us try a trip around the outdoors world in eighty steps.

*Crestmont Inn*

**CALLS YOU**

For a perfect family vacation high in the scenic Alleghenies. 2200 ft. Altitude. Rate includes many activities. Ranch-type cottages. Superb cuisine. Tot and teen-age directors. New pitch and putt course.

| | | |
|---|---|---|
| Golf | Water Sports | Concerts |
| Tennis | Lawn Bowling | Lectures |
| Riding | Shuffleboard | Dancing |

Open June 14 — Write for folder NA

W. T. DICKERSON, PRES.

**CRESTMONT INN, EAGLES MERE, PA.**

*Waterville Inn*

**A Complete Mountain Resort**

Secluded in a quiet valley entirely surrounded by the White Mt. Nat'l Forest. Wooded paths along the Mad River and miles of trails extend from the Inn to the mountain ponds and peaks. A comfortable Inn with private golf course, large swimming pool and tennis court complete the facilities of this fine resort.

***Mid-June to mid-October, and winter.***

**Advance reservations requested.**

**Telephone Park 6-2011**

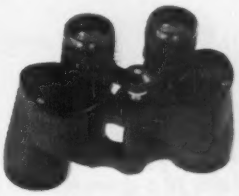
**WATERVILLE VALLEY**

(Campton P.O.)

**NEW HAMPSHIRE**

***REACH OUT . . .***

and thrill to the beauties of Nature that your unaided eyes cannot see.



**W-I-D-E ANGLE BINOCULARS**

7 power, 35mm objective lenses. Enjoy an enormous, breathtaking, panoramic field of view at 1,000 yards of . . .

**569 FEET!**

***Compare!*** This huge field of view enables you to locate subjects *quicker* and to follow action *easier* with a *minimum movement* of the instrument. The bird-watcher's and naturalist's favorite. Internally hard coated, achromatic optics. Fast, center focus. 30 oz. A fine, precision-manufactured, imported binocular, complete with leather case, shoulder and neck straps. Our low, low price of only **$52.89** includes 10% Fed. Tax and shipping.

**SATISFACTION GUARANTEED**

*Order today, from:*

**ARLO PRODUCTS, Dept. R**
**66 West Merrick Road**
**Valley Stream, New York**

**Get UNITRON's FREE**

**Observer's Guide and Catalog on**

**ASTRONOMICAL TELESCOPES**

**This valuable 38-page book is yours for the asking!**

With artificial satellites already launched and space travel almost a reality, astronomy has become today's fastest growing hobby. Exploring the skies with a telescope is a relaxing diversion for father and son alike. UNITRON's handbook contains full-page illustrated articles on astronomy, observing, telescopes and accessories. It is of interest to both beginners and advanced amateurs.

***Contents include—***

- Observing the sun, moon, planets and wonders of the sky
- Constellation map
- Hints for observers
- Glossary of telescope terms
- How to choose a telescope
- Amateur clubs and research programs

**UNITRON**

INSTRUMENT DIVISION of UNITED SCIENTIFIC CO.
204-206 MILK STREET • BOSTON 9, MASS.

Please rush to me, free of charge, UNITRON's new Observer's Guide and Telescope Catalog.

Name_____

Street_____

City_____ State_____

NM4

# THE Nature CAMERA

By EDNA HOFFMAN EVANS

**Pitfalls of Composition**

WHENEVER ANYBODY MENTIONS THE SUBJECT of composition, I always prick up my ears. Composition is a subject that interests me. At the same time, I think it is a subject that is extremely difficult to put into such words as make the result both readable and understandable.

What is composition? Webster defines it, in the fine arts sense, as "the art or practice of so combining the parts of a work of art as to produce a harmonious whole." A simpler definition that I heard not long ago called composition nothing more nor less than "a pleasing arrangement."

The photographer, like the artist, must be aware of the importance of composition. But the photographer, unlike the artist, is more bound by "things as they are." With brush on paper or canvas, with pen and ink, or with mallet and chisel on stone, the artist can create a good composition by arranging the elements of his work in whatever way he wishes.

The photographer can, to some extent, arrange his scenes and subjects. But he cannot transpose a tree, shift a boulder, move a stream or a mountain so that it is placed most advantageously in his picture. Only by moving himself, by shifting his point of view, by changing the focal length of his lens, can the cameraman actually do much to rearrange the objects he is picturing.

Of course, by making montages, using an air brush, or by other devices in the darkroom or on drawing board, the photographer can virtually create new pictures. But such devices are beyond the reach, abilitywise or with respect to equipment, of most hobbyists.

### Some basic facts

There are a few basic facts that can be enumerated and they usually are—on the subject of composition. For example, lines should lead the eye into the picture and not out of it. Occidental eyes, it is said, enter a picture from the lower left; thus the lead-in lines are best placed in that area. Also, when you have a strong lead-in line, you should have something of interest to hold the eye at the end of the line.

Horizontal lines are "lazy" lines, it is sometimes said, while vertical lines are "strong," and tend to dominate the picture. Verticals give a feeling of inspiration, of courage and uplift. Diagonal lines are the most active of the straight lines; they tend to impart a feeling of motion, and to give life to a picture. Curved lines also are important—all kinds of curves—for they tend to lead in and around. Hogarth, an eighteenth century English artist, maintained that the "S" curve was the "line of beauty"—but that was one man's opinion.

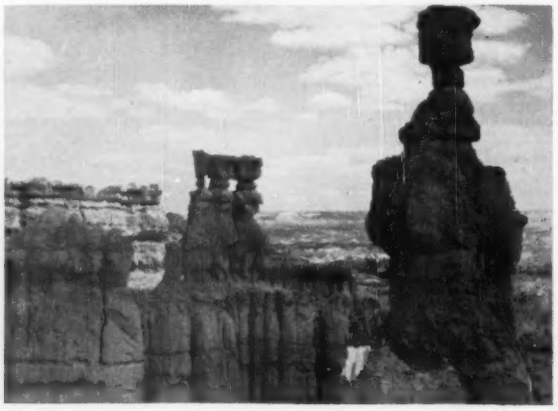
Composition, however, in truth consists of much more than lines. It is concerned with placement, with balance, with symmetry. Into it also go mass, color, detail, texture, pattern, design. All these play a part in the production (or the failure to produce) that quality known as composition.

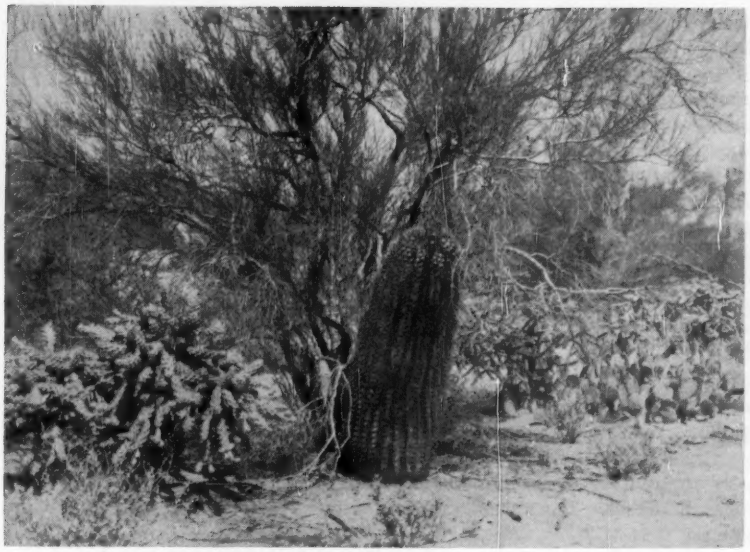
Taken from another aspect, what qualities make for poor composition? There are numerous factors here, too. Pictures cluttered with too many details show poor composition. In such pictures, no one object can be said to dominate; nothing stands out. The eyes grow weary and interest lags largely because there is too much to cope with comfortably.

In photography, a picture that lacks a center of interest—something on which the eye can focus, some "story-telling" detail—has poor composition. Landscape photographs often have this fault. A sweeping vista may be quite satisfying to the eye; but pictured, the same scene will seem dull, empty, and lacking in interest, unless there is some object to draw and hold it together. The placing of that center of interest is important, too. One of the basic rules of composition demands that the center of interest not be centered.

This is a sample of too much centering, and also of an unskillful attempt at framing. Note how there is half sky and half ground; the main subject is exactly centered. The picture divides into four equal areas. All these add up to bad composition.

The overall composition in this picture is better, but the two light patches are "hot spots" or "eye traps." They show how small details can be important in the effect of a composition. The light spots hold the eye more than their importance warrants.





This is a sample of a badly "cluttered" picture. There is too much detail, too much confusion, and nothing specific on which the eye can focus.

Place it left or right of center, above or below, but except in very rare instances, it should never, never, never occupy the exact center of a picture.

### Dividing subject matter

Other defects that mar the composition of a picture include too even a division of subject matter—fifty percent sky and fifty percent land, half light and half darkness—equality in such cases is undesirable. The horizon should not cut a picture in two, yet the horizon must at all times be horizontal. Barring hillsides and natural slopes, of course, few things are more distracting to me than a lop-sided horizon.

In both color and in black-and-white, the so-called "hot spots" and "eye traps" should be avoided. These are light or bright colored areas that so dominate the rest of the picture that they catch and hold the eye beyond all proportion, so far as their total value to the picture is concerned.

Still another composition defect is a "merger." This occurs when two objects run into one another, when posts or trees seem to be sprouting from people's heads, or when an animal's nose or a bird's body so blends with other (and less important) objects in the picture that it is difficult to tell where one leaves off and the other begins. Unwanted details, too, distract, although sometimes they can be eliminated by proper cropping or masking.

Framing is a device we photographers use in striving to improve our pictures. We try to hold our picture together by using a tree trunk on one side, or a gracefully drooping branch along the top. Maybe we even find an arch (natural or otherwise) to give our picture a definite three-sided frame. Used skillfully, framing does much to help a picture's composition; overdone, it defeats its ends completely. Framing should be unobtrusive. It is a finishing touch and not a dominating feature.

But in talking about composition, one should make use of actual samples—good and bad—if the discussion is to have much meaning. In a case like this, one picture is truly worth a thousand words.

### The cluttered picture

The picture of the desert flora—various cactuses and bushes in a confused conglomeration—is a good sample of a "cluttered" picture. True, the barrel cactus in the center may be said to be a "center of interest" but it is so surrounded and smothered by other plants that it cannot stand out or dominate as a center of interest should.

An artist might be able to rearrange these objects in a painting, but the camera must take them as is. I can think of no way in which this picture could be given good composition; no amount of framing or cropping would do the trick. It is one of those "pictures for the record," if you happen to want a record of a hodgepodge of desert plants.

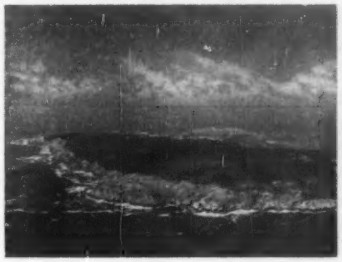
The first picture, with the interestingly shaped saguaro cactus in the center, is a sample of too much

the **BIG BADLANDS**
*of South Dakota*

Like century piled on century, the Badlands tell of Time's slow labors. See the colorful Badlands this summer. Vacation in the nearby Black Hills. Sightsee, golf, ride, hike, swim in America's *happiest* mountain playground.

WRITE FOR FREE COLOR FOLDER
SOUTH DAKOTA DEPT. of HIGHWAYS
H. O. DIXON, PUB. DIR. • PIERRE, SO. DAK.

*Island in Time*



Ten miles from the mainland's clocks, schedules, appointments and deadlines lies Monhegan, an Island in Time, where the days are measured by sun and tide. The Inn welcomes guests who enjoy tidal pools, land and sea birds, unusually varied flora—guests who appreciate the inner peace of quiet forests, shores compass'd by the voiceful sea, the stars for streetlights. Advance reservations necessary. June 2-September 8. Illustrated booklet. The Farrells, The Island Inn, Monhegan Island, Maine.

**HACKMATACK**

**CAMP FOR BOYS AND GIRLS INTERESTED IN NATURE STUDY**

A wonderful spot for youngsters 7-12 years of age! Here in the beautiful Berkshires our special facilities and expert staff is ready to help those interested in natural history subjects.

Geology, botany, birds, conservation, the sky, and all that lives in the earth, the air and water.

Swimming, riding, shop, crafts, daily farm activities.

Eight week season only

• *Write about your child to* •

**GEORGE F. DILLMAN**
**OTIS, MASS.**

centering and too much framing. The tall saguaro, with its strangely twisted arms, interested me. But somehow, in the camera viewer, it failed to tell much of a story. So I tried to give it an environment, to tie it in to its surroundings and make a composition of it. But the result is too stiff; there are too many areas of equality in it, and too many spots that are lacking in interest. It is childishly and unskillfully put together. As a "composition," it is a decided flop.

The eroded spires of Bryce Canyon are much more spectacular in color than they are in black and white. Nonetheless, this picture of them seems to me to show some qualities of good composition. The main center of interest (the spire on the right) is not in the center of the picture; it dominates and catches the eye, and yet it is balanced by the lesser spires in the background. They are there, playing minor but important supporting roles without which the main character would be alone and powerless.

The vertical lines are strong; they do uplift and inspire. Yet there are curves enough in their outlines—irregularities and variations—that give them interest and prevent monotony. The eye is not wearied by one single kind of shape or outline.

These are three samples that reveal some of the aspects of composition. The subject is such a varied one that we have scarcely scratched its surface. Next month we will consider it further.

## COLOR TO MONOCHROME

Here is interesting news for the photographer who wants to make black and white prints from his choice color negatives. Eastman has developed an enlarging paper—Kodak Panalure E—that can be used to produce top quality black-and-white prints from color negative materials. The starting point can be either a Kodacolor or an Ektacolor negative, and a typical tungsten light source.

Greater variety of tones can be obtained by the use of complementary or same-color filters on the enlarger. For example, if a dark, dramatic sky effect is desired, a deep-red "A" filter may be put over the lens of the enlarger. The results are similar to those obtained with a red filter and black-and-white film on the original subject. For more subtle effects, compensating filters may be used.

Prior to the introduction of the Panalure paper, it was possible for a darkroom adept to make fairly acceptable prints from color negatives on ordinary photographic paper such as Kodabromide or Kodak Medalist. But, because of the lack of red sensitivity in conventional black-and-white enlarging papers, the resulting prints had an unnatural look; reds came up as blacks while blues tended to print too light.

Only one (normal) contrast grade is available, but this can be varied by developer and developing time. Speed and image tone of the new paper are comparable to those of the Kodak Medalist. Recommended developing time is 90 seconds in Dektol (1:2) with the useful range of developing time between one and three minutes. If lower contrast is desired, Selectol or Selectol-Soft (1:1) may be used to gain a slightly warmer image tone.

The new paper comes in six sizes, from 5 x 7 up to 20 x 24; prices are the same as for double weight Ektalure paper.

This is a big step in color to monochrome printing; but readers please note that it calls for a color *negative*. To get a black-and-white print from the typical Kodachrome or Ektachrome transparency, an intermediate black-and-white negative step is still necessary.

# Catalog Case

(*Continued from page 213*)

rise, and will be lost in the morning twilight.

Venus, in the morning sky, will be very brilliant, but will remain fairly low in the sky. It will rise two hours before the Sun, and will be found low in the east at sunrise.

Mars is getting brighter, and will reach first magnitude in April. It will rise at about 3 A.M., and will remain low in the southeast until sunrise.

Jupiter, exceeded in brightness only by Venus, will be visible nearly all night, throughout the month of April, rising at 7:30 P.M. on April 1, at sunset on April 15. By the end of April it will set shortly before sunrise. Located in Virgo, it will be found due east of Spica.

Saturn, in Ophiuchus, will rise just before midnight at the beginning of April, and at about 10:30 P.M. at the end of that month. It will be low in the southern sky at dawn.

The Lyrid meteor shower may be expected on April 22. This is only three days after New Moon and, if the weather is good, the night should be favorably dark. The Lyrids is a relatively small shower. A single observer may see as many as a dozen meteors per hour, half of which would probably be Lyrids.

An annular eclipse of the Sun will take place on April 19. The path of the annular phase will start in the Indian Ocean. It will then move in a northeasterly direction, passing south of Ceylon, across Indo-China and Formosa, and will end in the Pacific Ocean. The partial phase will be visible in most of Asia, the eastern part of the Indian Ocean, Indonesia, the Philippines, Japan, Oceania, the northwestern peninsula of Alaska, and the North Pacific Ocean.

### New Appointments

Five top positions, opened up by changes in functions and organization of the U. S. Fish and Wildlife Service as authorized by the Fish and Wildlife Act of 1956, have been filled by the promotion of career employes of the Service. As announced by Commissioner Arnie J. Suomela, Dr. Albert L. Tester is now chief of the new Division of Biological Research; Harold E. Crowther is chief of the Division of Industrial Research and Services; Ralph C. Baker heads the Division of Resource Management; Robert M. Rutherford is the new chief of the Division of Technical Services, and John S. Gottschalk heads the Division of Sports Fisheries.

### Satellite Slides

The American Museum of Natural History's Hayden Planetarium has available a timely set of twenty-four 2 x 2 color slides, with accompanying script, just revised and brought up-to-the-minute, that illustrates and explains the development of the satellite program, the design and performance of research satellites, and the kinds of studies that satellites make possible. The series has been prepared by Hayden Planetarium astronomer Thomas D. Nicholson, and is available for purchase or rental from the Museum's Slide Library, Central Park West at 79th Street, New York City 24, New York.

**NATURE STUDY**

Spend your summer vacation at beautiful Elk Lake in the heart of the Adirondacks. Learn about the native plants, birds and other wildlife under the leadership of an experienced naturalist and teacher.

Excellent hiking trails, swimming, fishing and canoeing. Main camp and cottages with hotel service.

Two-week sessions, beginning June 28th and continuing through August 10th, dependent on reservations. Special group rates. For detailed information address

**Frank R. Schetty, 237 La Salle Ave., Hasbrouck Heights, N. J. or Mr. & Mrs. P. W. Sanders, Elk Lake Lodge, Blue Ridge, N. Y.**

**PARADISE FOR NATURE LOVERS**

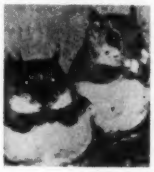
**MARCO ISLAND INN AND COTTAGES**

LARGEST OF THE TEN-THOUSAND ISLANDS. DELIGHTFUL SPOT FOR BIRD-LOVERS AND SHELL-COLLECTORS. FISHING AT ITS VERY BEST. BOAT TOURS. RENTALS BY DAY-WEEK-SEASON. SPECIAL RATES — APRIL, MAY, NOVEMBER, DECEMBER.

**BOB AND BETTY WHITAKER, MANAGERS**
**MARCO, FLORIDA**

**FLYING SQUIRRELS**

Cunning little fellows with their "bundle" of tricks. Beautiful, delicate little gliders. Fur soft and silky and always perfectly groomed.



Admired and loved throughout the world. Hundreds in stock. Write today for prices, literature and pictures. Enclose 10c for mailing.

**GREESON'S FLYING SQUIRREL RANCH**
**905 N. Monroe St., Arlington 1, Va.**

*The Largest Flying Squirrel Ranch in the World.*

**ARTHRITIS—RHEUMATISM VITAL FACTS EXPLAINED**

**FREE DESCRIPTIVE BOOK**

How crippling deformities may be avoided. This amazing FREE BOOK explains why ordinary methods give only temporary relief—if that. Describes a drugless method of treatment successfully applied in thousands of cases. Write for this 36-page FREE BOOK today. No obligation. **BALL CLINIC, DEPT. 543, Excelsior Springs, Mo.**

**BOOK MANUSCRIPTS CONSIDERED**

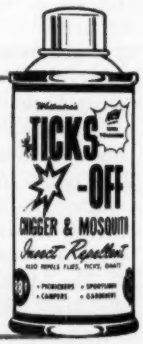
by cooperative publisher who offers authors early publication, higher royalty, national distribution, and beautifully designed books. All subjects welcomed. Write or send your MS directly.
**GREENWICH BOOK PUBLISHERS**
**Attn Mr. Gordon, 489 Fifth Avenue, N.Y., N.Y.**

**STOP INSECT BITES!**

TICKS-OFF repels, kills Mosquitoes, Ticks, Chiggers, Biting Flies—helps prevent sickness. **A NECESSITY ON PICNICS, CAMPING, FISHING, GARDENING,** etc. Wonderful for children. America's top spray-on repellent.

COMMENDED PARENTS MAGAZINE

**98¢**
*At All Better Retail Stores*





## Arboretum Opened

New York State Senator and Mrs. Thomas C. Desmond have announced that the arboretum at their home, about two miles north of Newburgh, New York — although privately owned and maintained — is now open to the public without charge from 10:00 A.M. to 4:00 P.M., on all weekdays. No advance notice of visits is necessary.

The arboretum now includes about five thousand trees, shrubs and woody vines, of nearly nine hundred different species, and is a result of the joining of two old Hudson River estates that were carefully planted about one hundred years ago. The arboretum, therefore, has many large and beautiful trees, some a hundred or more years old. It also has an especially fine location, with a striking view extending south nearly ten miles to West Point, through the precipitous highlands of the Hudson River.

About twenty years ago, Senator and Mrs. Desmond started to plant additional trees, shrubs and woody vines in what were formerly open spaces. They wanted to include in the arboretum specimens of all North American trees, shrubs and woody vines that might prove hardy in the Newburgh, New York climate, an objective that now has nearly been obtained. No attempt has been made to include a complete collection of all of the European, Chinese, or other foreign species; but those generally considered the most interesting or most ornamental foreign species also are well represented in the arboretum.

In 1950, the Desmond arboretum was awarded the silver medal of the Federated Garden Clubs of New York State, and also, in the same year, the large gold medal of the Massachusetts Horticultural Society.

## Pine Planting

Some thirty members of Boy Scout Troop 24 of Oahu Council, on the island of Oahu, Hawaii, recently have launched a tree planting project on an eroded firing range area of the island's military reservation. For the first planting, the forestry section of the Schofield Barracks army engineers have supplied the Scouts with several hundred Norfolk Island pines. The idea was conceived by M/Sgt. Edmond M. Hayes, troop scoutmaster, who is supervising work.

*Relax—Have Fun—*
*Enjoy Nature at its best*

**Each year our lovely 250 acre estate is visited by thousands of birds . . . and each year many of our guests return to take pictures of the birds, to enjoy the nature trail hikes, the beauty of the country, companionship with congenial people. Good food, complete comfort, sports for every member of the family are yours at this delightful country inn.**

Open All Year. Near Northfield Schools. Rates $11-$16 daily include meals. For color folder Tel. 341 or write

**A. Gordon Moody, Manager**
**EAST NORTHFIELD 31, MASS.**

**THE NORTHFIELD and CHATEAU**
**EAST NORTHFIELD MASS.**

**OUT OF THE PAST**
**Arrowhead Jewelry**

Earrings: Large, medium, small, $2.00 pair. Necklace: 18 inch chain, $1.50 each. Bolo Tie; Large Arrowhead $1.50 each (arrowheads Obsidian Black color). Stone Arrowhead making instructions; illustrated, Complete. Master this art, $1.00. Order now!

**Chief Blackhawk**
Box 546-NM, Kennewick, Wash.
(Dealers inquire)

**SEA SHELLS**

For Collectors. Thousands of species from over forty countries of the world. A grand hobby and educational too. Send your name today for FREE illustrated lists.

**HERMAN W. HOLLINGSWORTH**
**Seffner, Florida**

**Dinah Dee's Fabulous HUMMINGBIRD FEEDER**

*(actual photograph)*

You will enjoy watching the graceful flight of hummingbirds in your yard. This carefully designed Feeder will attract hummingbirds to your home. Unique glass-blowing technique provides maximum insect proofing. Simple to fill, easy to clean, fun to watch. Ideal gifts for all occasions. Instructions enclosed. Unconditionally guaranteed. **$1.95 ppd. $3.65 for two.** Sorry, no COD's. Order today, delivery by return mail.

**DINAH DEE**
**P. O. Box 6734, Dept. N**
**San Antonio 9, Texas**

### Teaching Conservation

The Soil Conservation Service of the Department of Agriculture has recently released a pamphlet, PA-341—entitled "Teaching Soil and Water Conservation"—that should be of more than ordinary value to teachers who would not only like to make clear the basic elements of soil and water conservation, but who also would like to take their classes through some planned activities that drive home the points discussed. For example, what is soil? This classroom and field guide starts by showing the student how to make some soil for himself. Having found out that soil is not something that just "happened," teacher and student progress through various steps of soil and water conservation, each activity being presented in two parts, a how-to-do-it part for the students, and an interpretive part for the teacher. The Soil Conservation Service also has published a bulletin entitled "Water Facts," showing why the nation's water resources are so important, and which dovetails nicely with the water conservation lessons of PA-341.

### Rare Element Uses

Much experimentation has been going on in the past few years among manufacturers of lenses—especially camera lenses—with the so-called "rare earths," which are more accurately described as rare members of the family of natural elements. It has been found that glasses whose chemical formulas include portions of rare elements like lanthanum, zirconium, tantalum, and others have enabled the lens-makers to simplify the optical systems of their instruments without sacrificing the all-important sharpness of image.

### The Big Itch

According to *Forestry Digest*, magzine of the American Forest Products Industries, consulting forester Frank Pipal of Omaha, Nebraska, has recently located what may be a record-sized poison ivy plant in the jungle-like growth of the Missouri River bottom land. Forester Pipal reports that this monster has a trunk more than five and a half inches in diameter, and that its ramifications cover an elm tree that is fifty feet tall. (Ed. note: —*Nature Magazine's* news-writer said that it made him itch just to record the fact. Have any of our readers ever seen a more robust poison ivy plant than this?)

### Bulletins

"Oil Derricks and Turkey Buzzards" is a recently published pamphlet of the National Wildlife Federation, 232 Carroll Street, Washington 12, D. C., that explains the facts behind the present controversy over the issuance of oil and gas leases on federal wildlife lands. Last October, Secretary of the Interior Fred A. Seaton promulgated a set of new regulations governing such leases, a move that brought a vociferous reaction from the oil and gas companies. This pamphlet gives the conservation-minded citizen a look into the facts behind the uproar.

"Curator" is the title of a new journal to be published quarterly by the American Museum of Natural History in New York City. Volume one, number one of this magazine-style publication for the modern museologist appeared in mid-February, handsomely produced by the offset method of printing, to provide "a vehicle for the expression of opinion, comment, reflection, experience, criticism and suggestion by the various members of the (Museum's) staff on all the activities of museum work." The editors hope that the pages of the new magazines will be open to articles of general interest, as the publication develops. Single copies are $1.50, and a year's subscription is $5.00.

"World Wide Sea Shells" is a catalog of sea shells and books about sea shells that are available from conchologist H. W. Hollingsworth of Box 355, Seffner, Florida. A good reference and price list for the shell enthusiast, illustrated.

"Topical Issues of 1957" is Handbook 20A of the American Topical Association, compiled by O. Frank Freedner. A listing of the voluminous topical postage stamp output of the world for 1957, by catalog number, country and general category. A number of Nature subjects are included among the general categories of the publication, which may be secured from the ATA at 3306 North 50th Street, Milwaukee 16, Wisconsin, for fifty cents.

### No Beauties

When the unemotional Smithsonian Institution describes a fish as "fantastically hideous," you may be sure that the creature has about reached the lowest rung on the ladder, photogenically speaking. But the fish that fish with their own poles, supply their own bait in the bargain, and sparsely inhabit the shallow inshore waters of tropical seas easily qualify for their description, according to Dr. Leonard P. Schultz, Smithsonian curator of fishes, in a recent Institution bulletin. A bony elongation of the dorsal spine furnishes the pole, and fleshy projections at its end, looking and acting like marine worms, supply the bait. When a victim nibbles at the bait, it is sucked into the ample mouth of the fisherman. Representatives of nearly every species of these salt water anglers can, to terrify an enemy, blow themselves up with either air or water to a few times their normal size. Dr. Schultz describes several hitherto unknown species from the collection of the Museum, and notes that the color of some species may change in accordance with environment.

### The Cold Facts

The National Academy of Sciences reports that a new record low temperature for Ice Island T-3, the 36-square mile fresh-water-ice shelf island in the Arctic first occupied in 1952, was recorded last January 4 when the thermometer touched —64°F. However, a warm spell during the balance of the month raised the 30-day mean temperature to a balmy —23°, compared to December's average of —40°, notes the Academy. An extensive program in meteorology, oceanography, marine biology and other scientific studies is being pursued by the inhabitants of T-3.

### Link Discovered

A happy find on the desolate north shore of Lake Superior has enabled George I. Quimby and Professor James B. Griffin, both of the Chicago Museum of Natural History, to link the historic Chippewa Indian tribe to a prehistoric culture known to archeologists as the Woodland type, dating back three to four thousand years. The Museum's Bulletin for January contains the story of how these two searchers came across their evidence, an occupation zone buried beneath the dune sands of Lake Superior, and what they found within it. The Museum's address is Roosevelt Road and Lake Shore Drive, Chicago 5, Illinois.

# THE Nature MARKET

**Classified advertising rate — 20 cents a word each insertion; minimum $3.00, cash with order. Discount; 3 times, 5%; 6 times, 10%; 10 times, 15%.**

## AUTHOR'S SERVICES

NO LUCK finding a book publisher? Learn about our successful program. Free Booklet—NT—Vantage Press, 120 W. 31st, New York City.

## BINOCULARS and GLASSES

BINOCULARS, BAROMETERS, TELESCOPES—Terrestrial and Celestial. Largest stock in town. Zeiss, Leitz Hensoldt, B & L Sard, Nikon, Bushnell, German, French and Japanese—new and used. Sold, Rented, Traded, Bought. 30 day free trial. Clean and repair all makes. Over 25 years of reliable optical service. BELZ Opticians, 15 East 40th St., New York N-16, N. Y. Come in or just write.

BINOCULAR HEADQUARTERS. All types and prices, postpaid by Museum Curator, a professional user. Liberal trades. Telescopes. Immediate answers. Bartlett Hendricks, Pittsfield 50-N, Mass. Phone 9748.

## BIOLOGICAL SUPPLIES

NATURALIST'S CATALOG 25c. Pairs: Hamsters $2.75, Flying Squirrels $12.50. 200 Mealworms $1.35. Ant Home $3.50. Ant Colony $4.15. Chameleon, turtle, salamander, frog; all 85c each. Quivira Specialties, Topeka 20, Kansas.

## BOOKS

BOOKS ON BIRDS, Mammals, Reptiles, Trees general nature subjects. Catalog sent on request. Pierce's, Winthrop, Iowa.

BOOKS. Hard-to-find and out-of-print our specialty. All subjects. Send Wants. Jaher Book Service, 183 Hazlewood Drive, Westbury, New York.

## BUSINESS OPPORTUNITIES

CASH FROM SAWDUST, Tin-Cans, Newspapers. Over 200 methods. Instructions $1.00. Charles Company, 12-XPB, Norwood, Ohio.

## BUTTERFLIES

RARE BUTTERFLIES, ovas of catocalas, S. mori, and others. Sale and exchange. Richter, Butterfly Museum, E. Durham, N. Y.

BUTTERFLIES: 20 Named United States including Giant Moths, Zebra, $2.00. 20 Different Amazon including Swallowtails, Gorgeous Urania, $2.00. 20 World Tropicals including Emerald Swallowtail, Huge Bird-Wing, $2.00. M. Spelman, 2277 Andrews Ave., New York 68, N. Y.

## BUTTERFLY MOUNTING AND COLLECTING KIT

FINEST and most COMPLETE KIT. Contains 15 tropical butterflies, 4x12 spreading board, 60 glass headed pins, 100 insect pins, 1 chemically treated relaxing jar for softening butterflies, 2 glass strips, paper strips, 1 glass top riker display mount, 1 pair broad point forceps, triangular collecting envelopes, a 16 page picture booklet with step by step instructions for mounting, dispatching, preserving butterfly collections plus other interesting information with nylon butterfly net for $4.95 postpaid. Nylon net $1.95 postpaid with instruction book. Free price list upon request, many butterfly bargains. America's largest dealer. Butterfly Art Jewelry, Inc., 291 East 98th St., Brooklyn 12, N. Y., Dept. N4

## COUNSELOR WANTED

COUNSELOR: Man or Woman over 20 years of age interested in Nature, Overnight Trips, and other out-door activities in exclusive summer camp for girls in southern Wisconsin, for July and August. Burr Oaks Camp, 717 W. Sheridan Rd., Chicago 13, Ill.

## HELP WANTED

CAMP COUNSELORS: Boys' camp in the Berkshires, near Tanglewood, has several openings for experienced men in outdoor camping, nature and nature photography; other specialties. Fine openings for school and college faculty and graduate students. Send full details, giving age, education and experience and phone number. Joseph Kreuger, 377 Irving Ave., South Orange, N. J.

## HOBBIES

SEASHELLS, Nature's Treasures of the Sea, appeal to Hobbyists. Lists of $1.00 to $5.00 Specials on request; 5 Odd Marine specimens $1.00; write for free lists today. Mrs. F. K. Hadley, 48 Adella Ave., West Newton, Mass.

## HOME STUDY

PAINT OILS: Exciting Home-courses. Trial Lesson $1.00, specify Landscape, Still-Life, or Portraiture. Prickett's Woodwind Studios, Monterey, Massachusetts.

## INDIAN CURIOS—RELICS

SELLING COLLECTION of over 100,000 Indian relics, arrowheads, tomahawks, stone axes, long spearheads, and knives, skulls, beads, pipes, pottery, etc. List free. Lear's, Glenwood, Arkansas.

SCALPING KNIFE, flint Thunderbird, 2 fine Indian war arrowheads $4.00. Catalog free. Arrowhead, Glenwood, Arkansas.

FIFTY ANCIENT ARROWHEADS $10.00 (plus Spearhead $11.00). New 1958 Book-Relic Catalog $1.00. Tilton Indian Relics, Topeka 20, Kansas.

STONE ARROWHEAD making instructions. Illustrated, complete, $1.00. Chief Blackhawk, Box 564-R, Kennewick, Washington.

## LEATHERCRAFT

FREE "Do-It-Yourself" Leathercraft Catalog. Tandy Leather Company, Box 791, R. 25, Fort Worth, Texas.

## LIVING COCOON

Living Cocoons, Butterfly Chrysalids, and moth pupae for sale. Many rare and beautiful nature species included in listings. Free price list sent on request. M. W. Osborne, 2100 Price Street, Rahway, N. J.

## MINERALS

LARGEST gem and mineral magazine tells how to have profitable fun with rocks, gems, jewelry and minerals. Monthly, only $3.00 a year. Sample 25c. GEMS & MINERALS, Box 687-N, Mentone, Calif.

## MISCELLANEOUS

VOLCANIC GLASS AND COLORED OBSIDIANS: Large specimen 25c pp. Ores of tungsten, copper, manganese, iron, boron, etc. Large specimen: 25c pp. free lists. Philip White, P.O. Box 1184, San Fernando, Calif.

BLACK WIDOW SPIDERS artistically mounted on clear plastic. $1.00 C.O.D. Jack Holt, Route 3, Waverly, Ohio.

A FARMER and active METHODIST is interested in a job in which his interests in conservation, biology and geology would be stimulated. M. B. Steinmetz, Alden, Kansas.

ACCURATE BOOKKEEPING by mail. 13 weeks service $2.98. For any small cash business concerns. Makes Income Tax reports easier. Elwin Sprague. Accountant Tax Services, 72 Eureka, Box One, Redlands, Calif.

## PLANTS

RHODODENDRON MAX., Mt. Laurel, Hemlock, Holly, Flame Azalea, Dogwood, Red Maple, and Red Cedar, 2-4 ft., 10-$4.00; 25-$9.00; 100-$30.00. J. F. Norris, Butler, Tenn., Rt. 4.

## SCIENTIFIC EQUIPMENT

SCIENCE SET—Demonstrates the glow of light similar to the fireflies and deep sea fish in blue, yellow, and orchid colors. Harmless. Ideal science teaching aid. Free Literature. Varniton Company, 416 N. Varney St., Burbank, Calif.

## SPORTING GOODS

"POW" Hunting slingshot, 2 rubber bands, 40 pellets, target complete $1.50. Extras, 275 pellets $1.00; 10 bands $1.00. Stone Dept. "Y", Box 2755, Santa Monica, Calif.

## STAMP COLLECTING

FREE—VALUABLE USA (1) Scarce genuine postage stamp picturing first USA, issued in 1847. (2) Big collection 30 all-different United States; ancient 19th century, valuable $1 stamp, etc. (3) Collection beautiful Commemoratives. (4) Collectors Guide: Big 64-page Bargain Catalog including all US Postage Issues; other exciting offers. Send 10c for mailing expenses. Harrisco, 4169 Transit Bldg., Boston 17, Mass.

AN UNUSUAL ASSORTMENT OF 100 diff. historic U.S. Commemoratives for only $1.00. This terrific offer is made only to acquaint you with our superior approval service of *all* U.S. and foreign stamps. Globus, New York 10, N. Y., Dept. 85.

FREE—103 British Colony Stamps. Approvals. Enclose 10c for handling. Niagara Stamp, St. Catharines 601, Ontario, Canada.

## TAXIDERMY

ANIMALS, BIRDS and FISH mounted and sold. Glass eyes for all purposes. Schoepfers, 100 West 31st St., New York 1, N. Y.

TAXIDERMY LESSONS 25c each. Birds. Fish. Antlers. Mammals. Tanning. Devereaux Taxidermy School, 724 N. Verlinden Ave., Lansing 15, Mich.

## TELESCOPES

SKYSCOPE, the full 3½-inch reflector, price—$29.75. Sixty power, ¼ wave aluminized mirror, equatorially mounted, ready for use. Guaranteed observatory clearness. Used by schools, universities. Straightforward descriptive literature on request. The Skyscope Company, Inc., 475N Fifth Avenue, New York 17, N. Y.

## TREES and SHRUBS

FEED WILDLIFE Nature's way. Plant beautiful wildlife shrubs. *Autumn Olive, 3'-5', 3/$1.95; *Toringo Crabapple, 2'-4', 3/$1.95; *Multiflora Rose hedge, 3 year SUPERS, 25c each. Write for other sizes, quantity discount. Postpaid. Greener Hills Nursery, Rt. 1, New Hope, Pa. *Tested and recommended for wildlife Soil Conservation Service.

## VACATION

NATURE LOVERS VACATION at secluded country place. Interesting wildlife. Swimming, Boating, fishing, trails. Adults only. Each room with private bath, excellent homecooking. $50 weekly. Write for folder. John and Beatrice Hunter, Hillsboro, New Hampshire.

## WESTERN MERCHANDISE

FREE CATALOG: Western Wear, Saddles, Boots, Leather Supplies. SILVER SPUR, Box 1785-H9, Fort Worth, Texas.

## WILDLIFE FILMS

WILDLIFE FILMS (8mm., 16mm., color, b&w), 2"x2" color slides, biggest selection. Buy direct and save. Real bargains in cameras, projectors, accessories, supplies. Big Catalog free. Blackhawk Films, Davenport 4, Iowa.


**Tells How You Can Learn to MOUNT BIRDS!**

**Learn At Home**

**Men, Boys,** Hunters, Fishermen, **mount** and **save** your lovely wild-game **trophies.** Be a **Taxidermist.** Mount **Birds, Animals, Heads, Fish, Tan** skins. **YOU** learn easily, quickly in **spare time.** Have a grand **home-museum.** The finest and the greatest **hobby known,** for sportsmen. **Fun, real profits.**

**FREE BOOK**

Yes, **FREE.** Beautiful **strange,** valuable **Book,** telling **all** about Taxidermy. Contains over **100** beautiful game-pictures. And it's yours **FREE,** if you rush your request. You can mount **all kinds** of **wild-game,** and common specimens too. We can positively **TEACH YOU.** So **GRASP** this opportunity. **RUSH** letter or postal for this **amazing FREE BOOK.** Don't delay. State your **AGE.**

**N. W. SCHOOL OF TAXIDERMY, 8104, Elwood Bldg., Omaha 2, Neb.**

# Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

## Family Album

### 9. Film Slide Projectors

As a supplement to our description of modern slide projection machines, lineal descendants of the old magic lantern, in the October, 1957, issue, we are adding some notes on a quite different sort of outfit. It does not as yet have a distinctive name of its own since, like its larger brothers, it, too, projects slides; but they are film slides, as the popular 2 x 2 (example, Kodachrome), the Bantam (828), and the super slides (1⅝ x 1½). Some thirty different manufacturers are marketing this type of projector, aimed primarily at the amateur photographer, among the best-known names being those of Argus, Bell & Howell, and Revere. To illustrate this form of projection machine, we have selected the newest, the Balomatic, which is keeping the Bausch & Lomb Optical Company humping in an effort to supply the demand. They report that a schedule of one machine completed every ninety seconds is insufficient.

Two models are being manufactured, the Balomatic 500 (using a 500-watt lamp) with fully automatic operation, and the Balomatic 300 (300-watt lamp) with finger-tip automatic operation. Slides are loaded in a magazine that holds forty, and are changed by electrical impulse, with remote control as an optional feature. The projection lens in both models is an f3.5 with Balcoated surfaces, giving a sparkling image with true colors. Bausch & Lomb emphasize that this instrument eliminates "pop" which, it appears, is now the trade jargon for slides bulging so that they lie out of focus.

#### Testing the machine

We were sent the Balomatic 500 (here illustrated) for testing, and found that it fully lived up to all advertised claims. It is indeed a beautiful instrument, finished in two-tone gray, chip-proof baked enamel, packed in an ingenious carrying case, the handle being a part of the projector and not of the case, making it impossible to drop the machine out of the case. There is a storage area for the electric cord and accessories. The control panel looks like the instrument board of an automobile, but its apparently formidable operation is quickly mastered. We found that the projector could be set on *automatic* and that it would then run itself, with no further attention, changing slides at longer or shorter intervals as the operator prefers; or it could be operated as far as fifteen feet away by the remote control cord if so desired.

Bausch & Lomb's new Balomatic 500, latest of film slide projectors.

We recommend that anyone interested in purchasing a slide projector of this type write for further information, illustrations, and prices to the Bausch & Lomb Optical Co., Consumer Products Sales Dept., Rochester 2, N. Y.

## Beginner's Primer

The average layman knows little, indeed, of the vast array of life in the great Order Hymenoptera. He is familiar with a few bees, wasps, and ants, but although these are the obvious types they are greatly outnumbered as to species, and outshone in diversity of habits, by the parasitic forms. Even the professional entomologist, if his interests lie in other pastures, may claim scant familiarity with the groups we are considering at present.

No clues can be given the beginner for the identification of many of these insects, a procedure that involves technical competence acquired only after training and experience, but if you are willing to get down to the size level in your Nature probings and collecting where the millimeter is your yardstick, you may hope to see and capture some of them. They range in size from minute—even to a fraction of one millimeter—to small; generally they have two pairs of wings (distinguishing them at once from the Diptera or flies) which are deficient in venation, and in frequent cases have patterns of dark and light areas ("pictured" wings); some have functionless wings, or are wingless (alate); the antennae and legs are plain, small, unnoteworthy; and the ovipositor of the female may be very long, in some cases even longer than the rest of her body, and may protrude from the abdomen some little distance forward from the rear end. Many are metallic in coloration, ranging from black through bluish to brown or yellow; some are more or less hairy." Only a few of the more than seventy families can be mentioned in any brief discussion.

The ensign flies, (Evaniidae), have the habit of carrying the abdomen raised like a flag, and may attain a size of 1½mm. They parasitize other insects.

#### Braconid wasps

The huge family Braconidae embraces species known as braconid flies or (better) braconid wasps, from the Greek for small, referring to their size. They parasitize a great many kinds of insects, including other hymenoptera. A typical case is one occasionally seen by the Nature rambler when he observes a caterpillar covered with small white cylinders that he supposes are eggs. Actually, these are the cocoons of a braconid, and the caterpillar has suffered a horrible fate. Eggs were laid by the female braconid within the body of the caterpillar host, the ovipositor piercing the skin or, in other cases, deposition was upon the skin and sometimes even on vegetation, whence the hatching larvae reach the host by contact. Such larvae then pierce the skin and feed upon host tissues. When mature, they make their way to the exterior, leaving a dead or dying caterpillar, upon whose skin each braconid grub now proceeds to spin a silken cocoon, resembling a miniature replica of the silkworm's casing,

and making a most attractive object for study under the microscope. Thus protected, the pupa transforms into the winged adult, and makes its escape by cutting out a circular lid at the free end of the cocoon. This is the general picture for all of the parasitic hymenoptera, and it can readily be seen that such creatures, when present in large numbers, constitute important allies for man in his eternal fight to control the multitude of destructive species in the insect world.

### Attack lice

The aphid parasites, (Incubidae), similarly attack plant lice. The female wasp inserts a single egg in a living aphid, showing great dexterity in performing this feat; then the embryo becomes a larva that eats the host tissues from within until only a shell is left. The parasite pupates within the host's skin and exoskeleton, and the adult then emerges by cutting a circular hole, with a hinged lid, in the back of the victim. Such gutted specimens may be observed in most colonies of aphids, the destruction sometimes achieving fantastic proportions, even up to 100 percent.

Entomologists obtain adult examples of these tiny hymenopters, for study and for display in collections, by rearing the hosts in containers so as to imprison the emerging parasites. Braconids and incubids are generally primary parasites, infesting a non-parasitic host, but in the next chapter we shall tell you about forms that are parasites of parasites, and parasites of parasites of parasites, even unto the fourth order—Nature's greatest exemplification of the familiar "Big fleas have little fleas upon their backs to bite 'em, and little fleas have lesser fleas and so ad infinitum."

## Optical Tricks

### 4. Paramecium in Your Blood

THE FACT that the real image in a compound microscope is formed at the level of the eyepiece diaphragm has been taken advantage of in micrometry, the making of measurements under the microscope, as is well known. A prepared coverglass, ruled with very fine lines, can be placed on this diaphragm, and it will be seen, apparently lying upon the specimen under examination. This is due to the fact that in the huygenian ocular, the field (lower) lens acts with the objective in forming the real image, while the eyelens (upper) is a simple microscope used to scan the real image and further magnify it. A hair fastened to the eyepiece diaphragm will serve as a pointer, seeming to lie among the structures of the object on the stage.

This construction may form the basis of some amusing tricks. Obtain two circular coverglasses of $\frac{3}{4}''$ diameter, and on one scribe a circle, near the edge, with a wax glass-writing pencil, making a fairly heavy wall of the wax. Inside this shallow cell place a large drop of a rich paramecium culture and cap with the second coverglass. Remove the eyepiece from the microscope, and unscrew the eyelens. Then place the prepared paramecium aquarium, right side up, upon the black metal disc seen to protrude part way across the cavity of the eyepiece tube—the eyepiece diaphragm. Replace the eyelens and put the ocular back into the microscope tube. Set up the microscope, stand vertical, with suitable illumination, and mount any object slide you wish. When focused, the paramecia appear to be swimming about among the details of the object.

### A dirty trick

If a cross section of the intestine is being scanned, the protozoans appear to be cavorting among the villi—any object may be used. Perhaps the height of dirty tricks is reached, however, if you prick your finger—following carefully the instructions against obtaining an infection—and mount a drop of fresh blood on a clean slide, capping it at once with a clean coverglass. Mount on the stage under the spring clips and examine, with moderate lighting. Now the paramecia wander among the blood cells, and if this preparation is shown to an unsuspecting novice, he is certain to start commiserating with you over the terrible condition of your blood, and advise the prompt attention of your physician!

"Why, that's nothing," you tell him, "we all have paramecia in our blood. Didn't you know that?"

Whereupon you promptly make a slide of *his* blood, and mount it for his inspection. His eyes are apt to pop out of his head, and so it is incumbent upon you to explain this optical illusion before you have a mental case on your hands.


**TESTA WIDE FIELD MICROSCOPE**

A Sturdy, Standard-sized, American-made Microscope with WIDE FIELD and 15x, 45x, 75x MAGNIFICATION for Live Nature and Whole Specimen Study in or outdoors.

Unusual versatility in use is one of its outstanding features. In addition to normal position for desk work, arm or tube may be inclined or reversed to operate in any direction of a 360 circle. Tube removable for field trips.
Price of Model A, illustrated, is $54.85. This includes not one but all three magnifications, 15x, 45x and 75x, coarse and fine focusing. Achromatic objectives. Send for Bulletin A-145.

If interested in our complete line of quality school microscopes at low cost, send for bulletin M-81. Please address Dept. NM.

**TESTA MANUFACTURING CO.**
10122 E. Rush St., El Monte, Calif.


## Book Reviews

### Animal Behavior

A fine collection of reports in certain areas of modern biological research is the *Twentieth-Century Bestiary*. The 24 accounts are written by 23 different authors, and consist of brief and popular versions of work in each one's chosen field of investigation. All are taken from recent issues of the *Scientific American*, and all are absorbingly interesting. Here, you can gain information from writers who are actively in the forefront of studies on insect, fish, bird, and mammalian behavior, including such problems as the language of bees, the courtship of animals, the spider versus the wasp, sonar and flight in bats and birds, the metabolism of hummingbirds and of shrews, curiosity in monkeys, and other fascinating topics. Highly recommended.

Pp. xi, 240; 3 figs. Simon & Schuster, 630 Fifth Ave., New York 20, 1955, $1.00.

### Histology

We were in for a surprise when the postman brought us for review *Human Histology, A Textbook in Outline Form*. For, along with at least a majority of teachers and writers, we would never have believed such a book possible: a histology (of all subjects) in outline form, and without a single illustration of any kind! But here it was, and what is more, by one of America's best-known edu-

cators, Professor Leslie Brainerd Arey, Northwestern University, Emeritus, whose *Developmental Anatomy* has long been the most successful of all texts in the allied field of embryology.

This is a full-length book that employs a terse style—mostly single-line sentences—direct, forceful, and clear. Different sizes and kinds of type, and a variety of headings and indentations, are used uniformly throughout the book, a feature that enables the reader to find what he wishes with minimum effort. In taking up each tissue or organ, there is first a brief preview of main points, then the structural plan, followed by detailed structure, regenerative ability, diagnostic features, and functional correlations.

We are fascinated by this original presentation of an old subject. Far from being dry or tiresome, it is entirely readable. Obviously, it represents an enormous amount of work, carefully and skillfully done. Both students and teachers will find it an invaluable laboratory aid, and a gold mine for reference or review.

Pp. ix, 337. W. B. Saunders Co., West Washington Square, Philadelphia 5, 1957, $6.50.

## Biocentennials

THE PRESENT year marks the four-hundredth anniversary of the death of Robert Recorde, who Cajori called the "morning star of English mathematical literature." This prolific and distinguished science author wrote *The Grounde of Artes* (1540), an arithmetic in which the plus and minus signs are introduced, and which was so successful that it went through a great many editions, and strongly influenced the mathematical education of his era.

Born in 1510, Recorde was trained at both Oxford and Cambridge, obtaining a degree in medicine from the latter in 1545. His *Whetstone of Witte* (1557) was a work on algebra wherein he employs the equals sign, and the *Castle of Knowledge* (1551) a popular science presentation, using his favorite form of communication, a dialog between a master and a scholar.

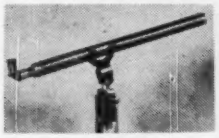
## Microcommercials

Williams, Brown & Earle, Inc., 904-906 Chestnut St., Philadelphia 7, have some attractive bargains in dissecting microscopes and in laboratory compound instruments, either Bausch & Lomb, American Optical, or Leitz, all completely reconditioned and guaranteed. This is an old, established firm, in whose claims one may place entire confidence. They have some compound microscopes with two objectives for as low as $35, newer models at $115, and three-objective instruments for $130.

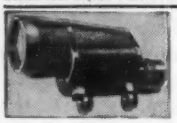
Add to your listing of scientific periodicals this German item: *Naturwissenschaftliche Rundschau*, Wissenschaftliche Verlagsgesellschaft M. B. H., Stuttgart. This is a monthly publication and costs $1.90 per quarter (three issues), postpaid. Each number, of approximately 50 pages, includes research reports, short scientific articles, reviews, and other items to foster the connections which link the various natural sciences.


**USEFUL OPTICAL BARGAINS for NATURE LOVERS**

**REAL 150 POWER ASTRONOMICAL TELESCOPE**
**Only $16.95, Postpaid**
**A good value at this price though not the equal of our reflecting scopes**



Refractor type! Clear, razor-sharp viewing of stars, planets, craters on moon, etc. 32mm achromatic objective lens! First surface mirror diagonal (ends "stoop" viewing). Removable eyepiece—interchangeable. 50, 75 and 150 power! Tube length 27½". Special attachment clamp for vibrationless viewing. Money back guarantee. Included free: 273 page "Handbook of the Heavens", Star Chart and 16 page Star Booklet.
**Stock No. 80,060-AL** ..... **$16.95 Postpaid**
**LARGER 42mm OBJECTIVE MODEL**—67, 100, 200 power—same features as above, with 38" tube length—(included free: "Handbook of the Heavens", Star Chart and 16 page Star Booklet).
**Stock No. 80,061-AL** ..... **$19.95 Postpaid**



**Just Right for Bird Watching**
**7 x 50 MONOCULAR**
This is fine quality, American made instrument—war surplus! Actually ⅓ of U.S. Govt. 7 x 50 Binocular. Used for general observation both day and night, for Bird Watching and to take fascinating telephoto shots. Brand new, $35 value. Due to Japanese competition we close these out at a bargain price. Directions and mounting hints included.
**Stock No. 50,003-AL** ..... **$15.00 Postpaid**

**See the Stars, Moon, Planets Close Up!**
**3" Astronomical REFLECTING TELESCOPE**
**60 and 120 Power - An Unusual Buy!**
**Famous MT. PALOMAR TYPE**

**PHOTOGRAPHERS!**
Adapt your camera to this Scope for excellent Telephoto shots and fascinating photos of moon!

**Assembled - Ready to use!** You'll see the Rings of Saturn, the fascinating planet Mars, huge craters on the Moon, Star Clusters, Moons of Jupiter in detail, Galaxies!
Equatorial mount with lock on both axes. Aluminized and overcoated 3" diameter high-speed f.10 mirror. Telescope comes equipped with a 60 X eyepiece and a mounted Barlow Lens, giving you 60 and 120 power. An Optical Finder Telescope, always so essential, is also included. Sturdy, hardwood, portable tripod.
**Free** with scope: Valuable STAR CHART and 272 page "Astronomy Book."
**Stock No. 85,050-AL** ..... **$29.50 f.o.b.**
(Shipping wt. 10 lbs.) **Barrington, N. J.**

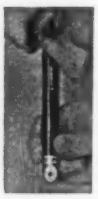
Be Ready to See Rockets Land on the Moon!
Order an EDMUND TELESCOPE Now!

**INFRARED SNIPERSCOPE TELESCOPE & PARTS**

See in the dark—without being observed. War surplus Sniperscope M-2. Gov't. cost about $1200. Instrument complete, ready to use. Includes Power Pack, infrared light source. Will operate from 6 V auto battery. Battery or transformer available.
**Stock No. 85,053-AL, $150.00 f.o.b.**
Save still more money! Build your own Sniperscope! We will furnish instructions — parts, including: Power Packs, 1P25A image tubes, light units, filters, etc.
For details — request FREE Catalog-AL

**Fine, American-Made Instrument at Over 50% Saving**
**STEREO MICROSCOPE**
**Up to 3" Working Distance — Erect Image — Wide 3 Dimensional Field**
Now, ready after years in development—this instrument answers the long standing need for a sturdy, efficient STEREO MICROSCOPE at low cost. Used for inspections, examinations, counting, checking, assembling, dissecting. 2 sets of objectives on rotating turret. Standard pair of wide field 10 X Kellner Eyepieces give you 23 power and 40 power. Additional eyepieces available for greater or lesser magnification. A low reflection coated prism erecting system gives you an erect image—correct as to right and left—clear and sharp. Helical rack and pinion focusing. Interpupillary distance adjustable. Precision, American-made! 10-DAY TRIAL. . .complete satisfaction or your money back.
**Order Stock No. 85,056-AL, Full price** ..... **$99.50 f.o.b**
(Shipping wt. approx. 11 lbs.) **Barrington, N. J.**
**Send Check or M.O.**

**Now 2 in 1 Combination Pocket-Size**
**50 POWER MICROSCOPE and 10 POWER TELESCOPE**
***ONLY***
**$4.50**
**Postpaid**



Useful Telescope and Microscope combined in one amazing, precision instrument. Imported! No larger than a fountain pen. Telescope is 10 Power. Microscope magnifies 50 Times. Sharp focus at any range. Handy for sports, looking at small objects, just plain snooping.
**Stock No. 30,059-AL $4.50 ppd.**
**Send Check or M.O.**
**Satisfaction Guaranteed!**

**4¼" ASTRONOMICAL TELESCOPE**

Mt. Palomar type. Up to 270 power. A fine Reflector Telescope complete with real Equatorial Mount and Tripod and 6 X Finder. Aluminum tube, 4¼" diameter mirror, rack and pinion focusing eye-piece holder, 2 eye-pieces and mounted Barlow Lens for 40 X, 90 X, 120 X and 270 X.
**Stock No. 85,006-AL complete** ..... **$74.50 f.o.b.**
(Shipping weight approx. 25 lbs.) **Barrington, N. J**

**GET OUR BIG FREE CATALOG #AL**
We have the world's largest variety of Optical items! Bargains galore . . . War Surplus — Imported — Domestic! Our stock includes Microscopes, Telescopes, Satellite Scopes, and Spectroscopes, Prisms, Lenses, Reticles, Mirrors and dozens of other hard-to-get Optical items.
**ASK FOR FREE CATALOG #AL**

*Order by Stock No.* *Send Check or M.O. or order on open account* *Satisfaction Guaranteed*

**EDMUND SCIENTIFIC CO., - - - BARRINGTON, NEW JERSEY**

# How can these magnificent Nature Guides be sold at only $1 each?

**De-Luxe Cloth Edition $2.50 Each**

THE six extraordinary books shown on this page represent a precedent-breaking value.

Each has 112 to 150 superb color plates, accurate to the most minute detail. The text has been prepared by the country's outstanding naturalists to help you identify, understand, and enjoy the varying aspects of nature's big show.

### Why the price is so low

These nature guides have been made as beautiful as the most modern methods of color engraving and printing could insure. The reason for their enormous value is simply the huge size of the printings—made possible by the enthusiasm of the American book-buying and nature-loving public. With a normal first edition of 10,000 copies, these books would retail at from $3 to $5 per copy. But the 75,000-100,000 printing of each book lowered the unit cost to a point at which the publishers were able to employ the highest standards and yet produce these books for as little as $1.

### Tributes from experts

Golden Nature Guides have been in wide demand among such organizations as the National Audubon Society, the Boy and Girl Scouts of America, museums and schools. Critics and experts have acclaimed these books as the finest nature guides ever published. Here are a few of their tributes:

**"Birds** is one of the finest introductions to bird study in many years." —*National Audubon Society*

**"Stars** is by far the best guide to the constellations in existence."—*Howard Papers*

"Surely there has never been a better book on **Insects** at the price."—E. S. Thomas, *Ohio State Museum*

**"Flowers** is a wonderfully helpful aid to beginners."—Farida Wiley, *American Museum of Natural History.*

**"Trees** is accurate and superlative." —R. W. Burnett, *University of Illinois.*

Each of these lovely pocket-size volumes is printed in four colors throughout, firmly bound in heavy laminated paper covers. Each is a book that brings you impeccably accurate information.

### An excellent value

You have to see the books for yourself to realize what a stunning value they are. Ask for them at your bookseller's. Or use the attached coupon. If you're not 100% delighted, return the book or books within 10 days for refund. If you do not wish to mutilate your magazine, simply write American Nature Association, 1214 Sixteenth St., N.W., Washington 6, D.C.

☛ Golden Nature Guides *are also available in a de-luxe cloth edition at $1.50 each.*

**BIRDS.** Identifies 265 species; 112 full-color plates; 128 silhouettes, range maps. Endorsed by Audubon Society. *By Dr. H. S. Zim and Dr. I. N. Gabrielson. Illus. by J. G. Irving.*

**STARS.** A guide to the constellations, sun, moon, planets, meteors, comets. 150 color paintings, constellation maps. *By Dr. Herbert S. Zim and Dr. Robert H. Baker. Pictures by James Gordon Irving.*

**FLOWERS.** 134 paintings, arranged by color for quick reference, show 200 common wild flowers. Range maps. *By Dr. H. S. Zim and Dr. A. C. Martin. Illustrated by Rudolf Freund.*

**INSECTS.** 225 species in full-color. Habitat pictures, structure diagrams, range maps. *By Dr. H. S. Zim and Dr. Clarence Cottam. Pictures by James Gordon Irving.*

**TREES.** Leaf-shape Key identifies 150 species. Over 100 full-color plates. *By Dr. Herbert S. Zim and Dr. Alexander C. Martin. Pictures by Dorothea and Sy Barlowe.*

**REPTILES AND AMPHIBIANS.** Full color paintings identify 212 species. Range maps, family trees. *By Dr. Herbert S. Zim and Dr. H. M. Smith. Illustrated by J. G. Irving.*

**MAMMALS.** 218 mammals in full-color. Clear, concise text on each with range maps and family trees. *By Dr. Herbert S. Zim and Dr. Donald Hoffmeister. Illustrated by James Gordon Irving.*

**FISHES.** Superb color plates illustrate hundreds of facts about American fresh and salt-water species. *By Dr. H. S. Zim and Dr. Hurst S. Shoemaker. Pictures by James Gordon Irving.*

**AMERICAN NATURE ASSOCIATION**
**1214 Sixteenth St., N.W., Washington 6, D.C.**

Enclosed is $..... for which send me the GOLDEN NATURE GUIDES I have checked below. If not delighted, I may return my purchase within 10 days for refund.

Regular edition $1.00 De-luxe edition $2.50

| | Birds | Stars | Flowers | Insects | Trees | Reptiles | Mammals | Fishes |
|---|---|---|---|---|---|---|---|---|
| (R) | | | | | | | | |
| (D) | | | | | | | | |

(R) Regular edition (D) De-luxe edition

Name.....
(PLEASE PRINT)

Address.....

City..... Zone..... State.....

UNIVERSITY MICROFILMS
313 N. 1ST ST.
ANN ARBOR, MICH.

FREE

IF you have ever watched your child at play—secure, happy, unafraid—you have seen the strongest argument in the world for investing part of every pay in United States Savings Bonds. For bonds, which can protect her present and insure her future, are savings you cannot lose. They're Government-insured up to any amount. They pay 3¼% interest when held to maturity. And they make saving for security easier—because you can buy them automatically through the Payroll Savings Plan where you work. Or regularly where you bank. Why not start your bond program today? Make life more secure for someone you love.

*The U. S. Government does not pay for this advertisement. It is donated by this publication in cooperation with the Advertising Council and the Magazine Publishers Association.*